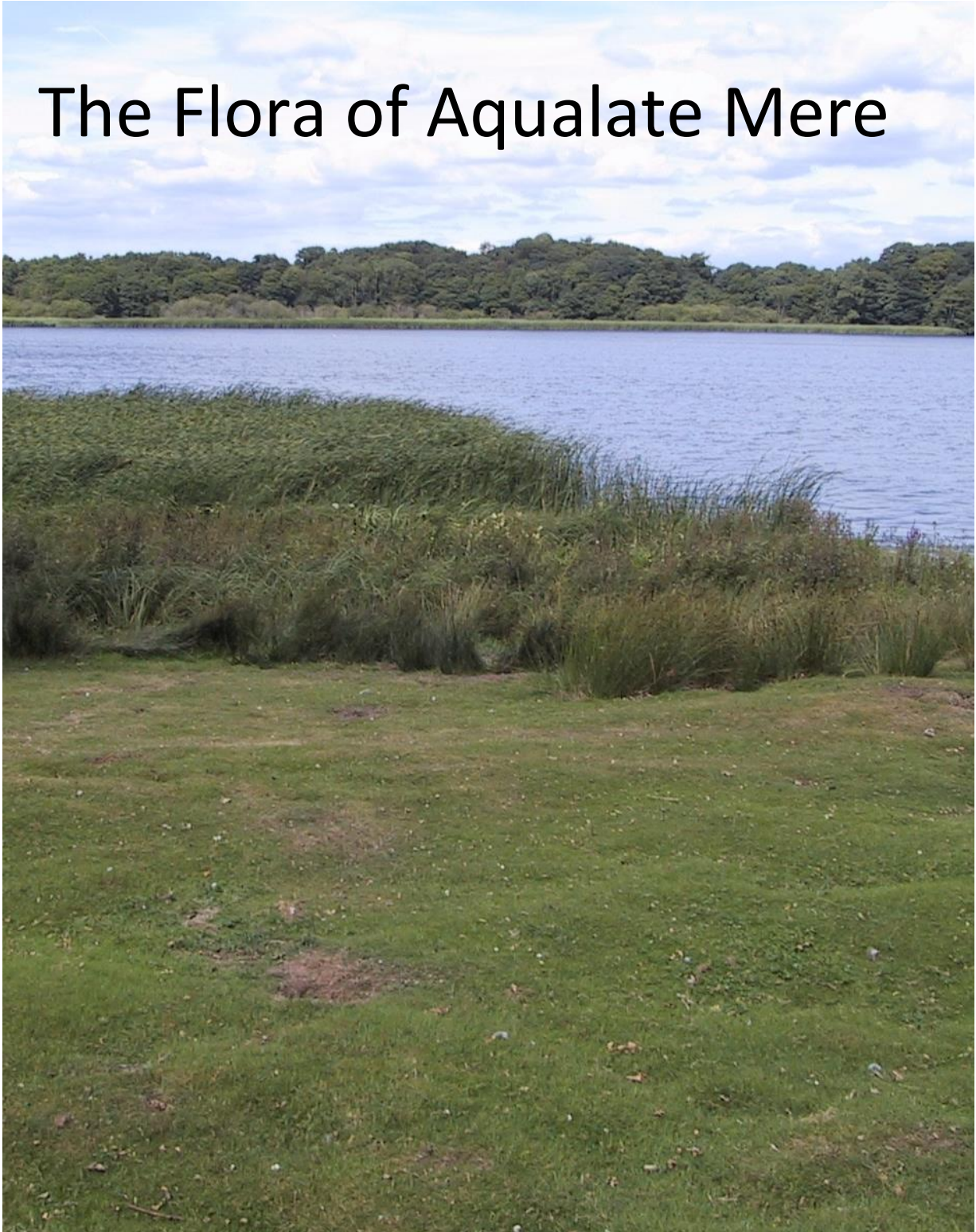


The Flora of Aqualate Mere



A.J. Lockton, January 2022

Based on a survey by Whild Associates Ecological Consultants to English Nature,
Attingham Park, Shrewsbury, in 2005

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Introduction

Aqualate Mere is situated 3km north-east of the town of Newport, Shropshire, just across the county boundary into Staffordshire, v.c. 39. It straddles the 1km squares SJ7620 and SJ7720, with parts of the site extending into SJ7820 and several other neighbouring squares. The mere has a surface area of approximately 72 ha. It has four significant inflow streams which drain huge areas of land to the north, east and south, and it is also fed by a number of small ditches that drain the basin in which the mere lies. It has one outflow, the River Meese, which flows north-west towards Forton, and ultimately joins the River Tern.

□ Location plan



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The mere is situated within an extensive basin that is largely filled with peat. It is the remnants of a much larger wetland that has been progressively drained over the centuries. To the south of the mere the land rises quite steeply to the deer park and the hall, and to the north there are several low hills that are considered to be characteristic of glacial deposits. To the east and west the flat peatlands stretch for at least a kilometre in either direction, and are divided up by numerous drains.

The site was first notified a SSSI in 1956. It is of interest for a range of features, including its geomorphology, migratory birds, invertebrates and vegetation. It is a National Nature Reserve, managed by English Nature under an agreement with the private landowner, and it is included within the Midlands Meres & Mosses Ramsar Site.

The current survey was commissioned in order to provide an updated account of the vegetation and plants in the SSSI. It is part of a series of surveys that monitor changes in the meres and mosses and allow comparisons between sites, setting the whole Meres & Mosses series into a national context. Historical information and previous surveys have been used in combination with data from new fieldwork, and presented here in full.

Methods

Historical records were obtained from the Biological Records Centre, Monks Wood, and from published sources such as county Floras (Shaw 1798, Edees 1972). Reports in English Nature's files at Attingham were accessed, as was the database of the current Staffordshire Flora Project. Biological records were compiled on a Recorder (Ball 1997) database using current botanical nomenclature (Stace 1997 & 2003, Blockeel & Long 1998) to facilitate comparison. Quadrat data was extracted from these sources and compiled on the database Vespan (Malloch 1997) for re-analysis using Match (*ibid.*). Quadrats were re-numbered to give them a unique identity amongst samples of the vegetation recorded in the Meres & Mosses series.

- View of the mere from the south shore.



Historical records and previous surveys

In his *Natural History of Staffordshire* (1686), Robert Plot (1640-1696) mentions Aqualate Mere twice. Unfortunately, neither of these includes any botanical observations. In chapter 2, paragraph 22, he describes the mere as being 1848 yards long by 672 broad. This is equivalent to 1,690m × 614m, 130m longer and 44m wider than it is now. He also explains the origin of the name (from aqua = water, and late = wide) in chapter 10, para. 6.

- The Natural History of Staffordshire, Chapter 2 para. 22.

betwixt his house and *Basford*, into *Churnet*; once removed a stone of three or four *Tun*, at least a bows shoot.

22. The *Currents* also of most of the other *Rivers* are rapid enough, but some of them indeed much quicker than others, as the *Trent* than *Sow*, and *Sow* than *Penk*; yet all of them so swift, as to prevent any vapid noisom vapors from ascending thence to infect the *Air*, though it must needs indeed be rateably better or worse, according as their *streames* be swifter or slower. Beside the *Rivers*, the *Meers* and *Pools* of this *County* are many and large, whereof that at *Aqualat* is 1848 yards long, and 672 yards broad, which it holds within a trifle more or lesse, almost from one end to the other; and *Ladford poole* is said to contain about threescore Acres; to which add *Cockmeer*, *Eccleball Castle* pooles, *New-pooles*, the poole at *Mare*, with divers others: All which either having *Rivulets* that continually pass through them, or being fed with liveing *Springs*, and plentifully stock't with Fish which perpe-

* *Vid. §. §. 84, 85, 86. of this Chapter.*

F 2

tually

- Chapter 10 para. 6.

tion.

6. And this is the only *Antiquity* that seems to have any pretence of ever having been a *British* habitation, unless the tradition concerning *Willbrighton* in this *County*, viz. that the *Romans*, when they came against it, termed it *Villam Britonum* (which name it still keeps with little alteration) may pass for one: but there being no footsteps remaining of its ever being *tenible*, tho' it lyes high, I much question whether this tradition, have not been broached of late years, by some fond *Etymologist*. Tho' it cannot be deny'd that the *Romans* had indeed some action hereabout, there being a raised work here at *Morton* not far off, which seems to be of their fashion; and no question the large *Meere* that lyes just below it, had its name of *Aqualat* [*quasi aqua lata*] from them; and the *banks* on the N. N. E. side of it, the name of *Anc's-bills*, from some *Roman* Captain that lay upon them, whose *name* or at least *prænomen* perhaps might be *Ancus*. Not to mention that all these are in or near the parish of *Forton*, and that there is a village not far off also call'd *Warton*, which are both thought to derive their names from some such actions, as are presumed by the story, to have happen'd hereabout. But I doe by no means prescribe to my *Reader* in this matter, desiring him to beleive no more than he thinks these grounds will fairly admitt of; every body being left in this, and all other matters whatever in this *History* to his own creed.

7. But though I could certainly meet with no other places

The earliest botanical record we have for Aqualate Mere is by Jonathan Stokes (1755-1831) in his 1787 edition of Withering's *Botanical Arrangement*. He found *Eriophorum angustifolium*, Common Cottongrass 'covering several acres.' It has not been recorded there again, which is quite remarkable, as it is not a rare species and it does tend to persist in unsuitable habitats for some time. It seems likely that Stokes found it in an area of recently drained mire. Tallis (1973) showed how changes in the water level of a mere used to trigger the formation *Sphagnum* mire in the days before they became too eutrophic, and it seems possible that there could have been such habitat almost anywhere around Aqualate at that time. The early loss of this species suggests that there must have been some very thorough agricultural intensification at quite an early date.

Calamagrostis canescens, Purple Small-reed, was recorded by Stokes in his 1796 edition of Withering's *Arrangement*. This is a very characteristic plant of the site, and it has been seen there many times subsequently. It was abundant around the mere this year, in woodland, swamps and grassland, so it clearly has the ability to survive changes in management.

Rev. Stebbing Shaw's 1798 *History and Antiquities of Staffordshire* was in part an attempt to update Plot's *Natural History*, and it included a list of plants, fungi and algae in the county compiled by Samuel Dickenson (1730-1823). The list is patchy and largely focused on the parish of Blymhill, where Dickenson was rector from 1777. It contains records of ten identifiable species at Aqualate and one of 'Reindeer Moss,' which could have been one of several lichen species. Dickenson's species are: *Chara hispida*, *Leucobryum glaucum*, *Aulacomnium palustre*, *Drepanocladus aduncus*, *Hottonia palustris*, *Carex curta*, *C. vesicaria*, *Calamagrostis epigejos*, *C. canescens* & *Phragmites australis*.

Dickenson's *Chara hispida* should be taken as a general record of *Chara* sp., as the individual species of charophyte were not clearly distinguished at that time (N.F. Stewart, pers. comm.). It was in 'ditches in Forton Moors, near Aqualate Mere,' which is probably somewhat to the west of the NNR. The first two bryophytes are species of raised mires, which fits well with Withering's find of *Eriophorum*; the *Drepanocladus*, however, is a plant of base-rich pools. There must be a possibility that Dickenson misidentified it, as he described it as occurring in bogs near the mere, but 'bog' is an imprecise term that could as easily mean any pool filled with vegetation.

Most of the other species Dickenson recorded have been seen since. Edees (1972) queried the *Carex vesicaria* record, suggesting that he may have meant *C. rostrata*. However, John Hawksford and Ian Hopkins also recorded *C. vesicaria* in a field to the north of the mere in 2002, so perhaps Dickenson was right after all. *Calamagrostis epigejos* was another unusual find: it is not a common plant in Staffordshire, and it occurs mainly on waste ground, where it is a casual. Dickenson described it as occurring by the edge of the lake near the boathouse on the south-west shore, growing with *C. canescens*, so it is difficult to imagine what he could have mistaken it for.

Robert Garner's *Natural History of Staffordshire* (1844) contains many more records for Aqualate, most of which were by Dr Garner (1808-1890) himself. In 1838 he found *Ranunculus lingua*, Greater Spearwort, in a ditch on the north side of the lake. It was still there in 2002, according to Hopkins & Hawksford. Roger Hill also recorded this species in 1980 in a ditch he labelled 23/24, which was apparently at the western end of the site; but no-one else has found it at Aqualate Mere.

Other records by Garner reveal the quality of the mere at that time. In the lake he found *Nymphaea alba*, *Sparganium natans* and *Typha angustifolia*; the *Apium inundatum* and *Baldellia ranunculoides* were probably on the margins, in the draw-down zone; *Calamagrostis epigejos* and *C. canescens* were presumably still on the south shore, where Dickenson had previously found them; the raised mires, which would have been at both the western and eastern ends, contained *Osmunda regalis* and *Myrica gale*, *Salix repens* and *Carex curta* (all of which will persist long after a mire is drained). In the meadows there was *Thalictrum flavum* and *Cirsium dissectum*, and in the ditches and streams were *Hottonia palustris*, *Myriophyllum verticillatum*, *Utricularia vulgaris* and *Hydrocharis morsus-ranae*. Garner even noted *Onopordum acanthium*, Cotton Thistle, in the park. These records demonstrate a variety of habitats characteristic of the best of the meres, and demonstrate that numerous rare species were present. It is unfortunate that the site was not more thoroughly botanised at this time, because it may well have contained more of the rarities that persisted in some of the other meres in the series.

On 25th June 1864 John Fraser (1820-1909), a doctor from Wolverhampton, visited Aqualate. He collected some specimens that are now in the herbarium of the University of Hull, and included a list for the site in a paper in the Transactions of the Dudley Field Club (Fraser 1865). Some of these are repeats of earlier finds, but others are new; for example, he was the first to record *Samolus valerandi*, Brookweed, which is a rare plant in Staffordshire. It has since been seen many times, most recently by Hopkins & Hawksford in 2002. Fraser's full list is given below.

□ Species recorded by Fraser in 1864

<i>Nymphaea alba</i>	<i>Euonymus europaeus</i>	<i>Triglochin palustre</i>
<i>Nuphar lutea</i>	<i>Myosotis scorpioides</i>	<i>Carex remota</i>
<i>Myrica gale</i>	<i>Cynoglossum officinale</i>	<i>C. ovalis</i>
<i>Samolus valerandi</i>	<i>Cirsium dissectum</i>	<i>C. pulicaris</i>
<i>Astragalus glycyphyllos</i>	<i>Senecio aquaticus</i>	<i>Calamagrostis canescens</i>

In July and September 1925 George Claridge Druce (1850-1932) collected Grasswrack Pondweed *Potamogeton compressus* at Aqualate Mere. There are specimens at the Natural History Museum, Oxford and Edinburgh determined by James Dandy and Sir George Taylor, so the identification is not in doubt. This is perhaps the only nationally rare species ever recorded at Aqualate, and so it is a significant find. It is quite apparent (from their records at other sites) that the earlier Staffordshire botanists did not pay much attention to aquatic plants, so the lack of any previous records does not reveal anything about its presence or absence. However, in the 1920s Grasswrack Pondweed was not uncommon in the canal network throughout Britain, and it is not a plant of the meres. It favours slowly-flowing calcareous waters. The most likely explanation is that it had recently arrived from the nearby canal and it became established for a short while. It has never been seen at Aqualate again, and there is no reason to consider it a characteristic species of the site.

Eric Edees visited Aqualate Mere on 5th September 1953 and wrote a report for the Nature Conservancy that is now on file at Attingham Park. This includes a short site description, a list of 64 of the more interesting species, and a simple site plan showing some of what he considered to be the key features. The list and map are reproduced in full below.

Among the species Edees considered worthy of mention was *Samolus valerandi*, which he described as abundant along the south shore. This was an area of 'shingle beach' that was grazed right down to the water's edge. The map shows a sizeable stand of *Schoenoplectus tabernaemontani* off this shore. Both species are still present, but much less abundant than formerly. Edees found *Orchis latifolia* (= *Dactylorhiza praetermissa*) to be abundant in pasture at both the west and the east ends of the mere. It is also still present (at least at the western end), but not abundant.

In 1954 he evidently went back to Aqualate, because a couple of records from that date appear in his *Flora of Staffordshire* (1972). These are of *Cynoglossum officinale* on the ridge to the west of the mere, and *Carex elata*, new to the site, in a ditch to the west. It has since been seen here several times, and was still present this year.

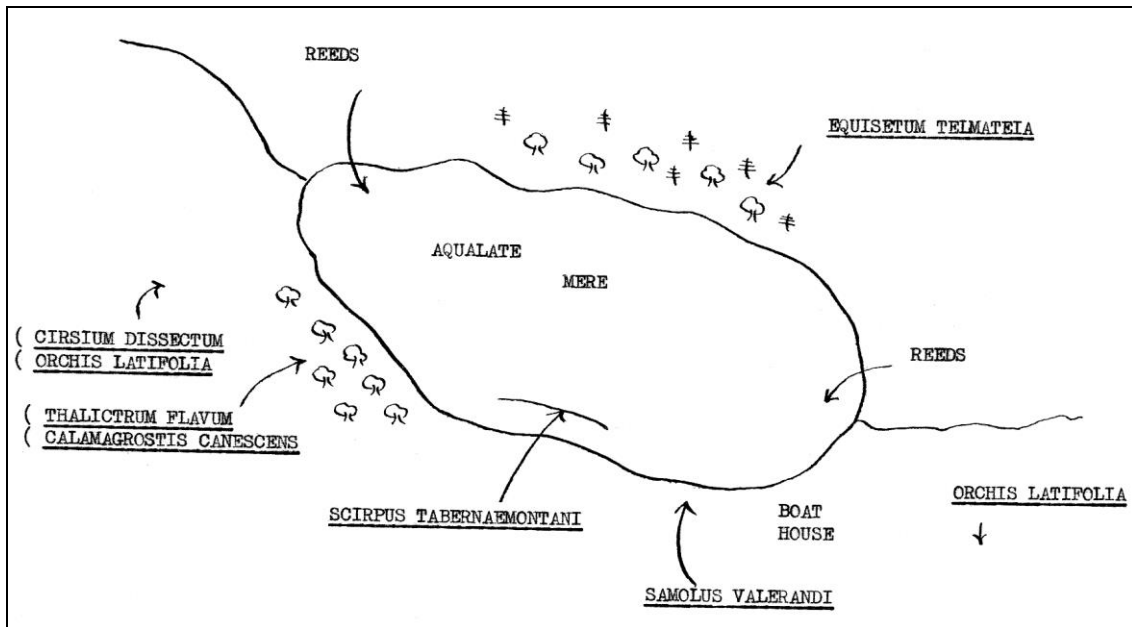
□ Species recorded by Edees in 1953 & 1954

Equisetum telmateia
Caltha palustris
Ranunculus sceleratus
R. flammula
Thalictrum flavum
Urtica dioica
Moehringia trinervia
Stellaria uliginosa
Lychnis flos-cuculi
Persicaria hydropiper
Rorippa palustris
Cardamine pratensis
Lysimachia nemorum
L. nummularia
Samolus valerandi
Filipendula ulmaria
Lotus pedunculatus
Epilobium hirsutum
E. parviflorum
Circaea lutetiana
Hydrocotyle vulgaris
Apium nodiflorum

Myosotis scorpioides
M. laxa
M. discolor
Scutellaria galericulata
Lycopus europaeus
Mentha aquatica
Scrophularia auriculata
Veronica catenata
Galium palustre
Viburnum opulus
Valeriana officinalis
Cirsium dissectum
C. palustre
Senecio aquaticus
Eupatorium cannabinum
Alisma plantago-aquatica
Schoenoplectus tabernaemontani
Carex paniculata
C. otrubae
C. disticha
C. ovalis

C. hirta
C. riparia
C. panicea
C. viridula ssp. oedocarpa
C. pallescens
C. nigra
Glyceria maxima
Deschampsia cespitosa
Holcus lanatus
Phalaris arundinacea
Agrostis stolonifera
Calamagrostis canescens
Alopecurus geniculatus
Phleum pratense
Danthonia decumbens
Phragmites australis
Sparganium erectum
Iris pseudacorus
Dactylorhiza praetermissa
Cynoglossum officinale
Carex elata

□ Botanical site plan by Edees in 1953



There is a report in the Bulletin of the Mid-Staffordshire Field Club of a visit to Aqualate Mere on 13th May 1973 (Baines 1973). This was led by Betty & Alex Jennings, who made a short species list, although the weather was inclement. Having been made so early in the year, their list contains some interesting records of species such as Pink Purslane *Claytonia sibirica* and 'beautiful vistas of bluebells' that have not been recorded by other surveyors.

□ Species recorded by Jennings & Jennings in 1973

Dryopteris affinis
Caltha palustris
Claytonia sibirica
Montia fontana

Moehringia trinervia
Stellaria holostea
S. uliginosa
Silene dioica

Viola riviniana
Arabidopsis thaliana
Cardamine amara
C. flexuosa

<i>Erophila verna</i>	<i>Prunus avium</i>	<i>C. disticha</i>
<i>Primula vulgaris</i>	<i>Pentaglottis sempervirens</i>	<i>C. acutiformis</i>
<i>Hottonia palustris</i>	<i>Lamiastrum galeobdolon</i>	<i>C. nigra</i>
<i>Ribes rubrum</i>	<i>Veronica chamaedrys</i>	<i>Hyacinthoides non-scripta</i>
<i>R. nigrum</i>	<i>V. montana</i>	
<i>Chrysosplenium oppositifolium</i>	<i>Carex paniculata</i>	

On 22nd June 1975 Mr G.M.A. Barker, from the Nature Conservancy, surveyed fields 3 and 6 and made a list of 26 species there. These were presumably unremarkable fields of cattle pasture, but it is interesting to see that they contained *Thalictrum flavum* and *Cirsium dissectum*.

□ Species recorded by Barker in 1975

<i>Caltha palustris</i>	<i>Lysimachia nummularia</i>	<i>Myosotis arvensis</i>
<i>Ranunculus acris</i>	<i>Filipendula ulmaria</i>	<i>Mentha arvensis</i>
<i>R. repens</i>	<i>Potentilla palustris</i>	<i>Galium palustre</i>
<i>R. flammula</i>	<i>P. anserina</i>	<i>Succisa pratensis</i>
<i>Thalictrum flavum</i>	<i>P. reptans</i>	<i>Cirsium dissectum</i>
<i>Cerastium fontanum</i>	<i>Lotus pedunculatus</i>	<i>C. palustre</i>
<i>Lychnis flos-cuculi</i>	<i>Trifolium repens</i>	<i>Bellis perennis</i>
<i>Cardamine amara</i>	<i>T. pratense</i>	<i>Senecio aquaticus</i>
<i>C. pratensis</i>	<i>Hydrocotyle vulgaris</i>	

The Biological Records Centre has a record attributed to a certain S.R. Price, dated 15th July 1979, of Orange Foxtail, *Alopecurus aequalis*, at Aqualate. This is a characteristic plant of the meres, but no-one else seems to have recorded it there. It is probably best to consider this record unconfirmed unless some supporting evidence comes to light.

On 4th September 1979 Martin Wigginton and colleagues from the England Field Unit of the Nature Conservancy Council surveyed Aqualate Mere and produced a species list of 135 taxa, a site description and an assessment of the vegetation. They also drew a plan of the lake showing key features of the aquatic flora and marginal vegetation.

Wigginton's survey was by far the most thorough to date and the first to collect data that could usefully be analysed. Their quadrats are reproduced in the section on vegetation below and reanalysed to produce NVC types. Their full species list and site plan are shown below. On some databases they are attributed with a record of Pillwort *Pilularia globulifera*, but this is not in their report and it may have been an error of data entry elsewhere.

□ Species recorded by Wigginton *et al.* 1979

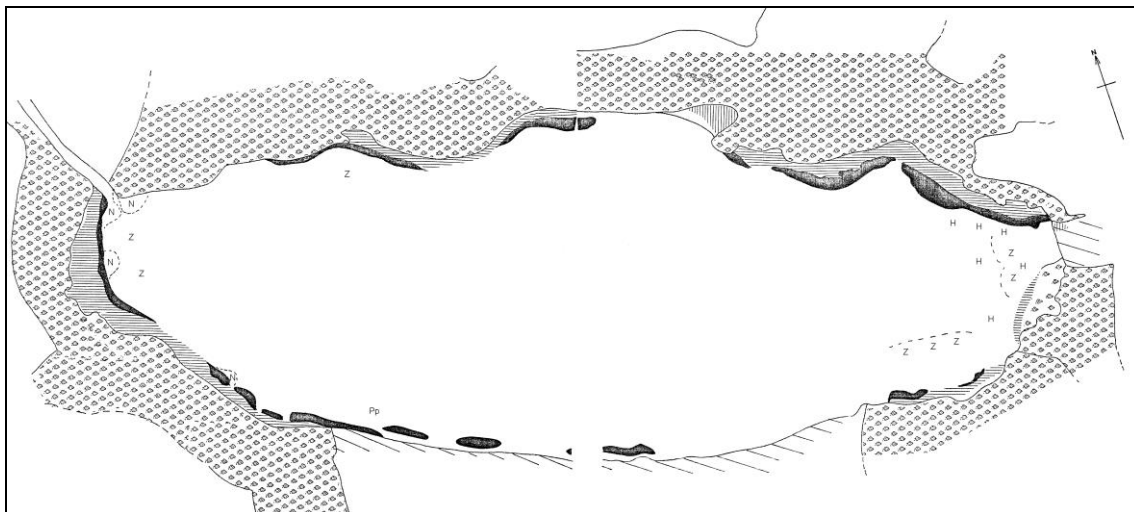
<i>Lophocolea bidentata</i>	<i>R. sceleratus</i>	<i>R. hydrolapathum</i>
<i>Chiloscyphus polyanthos</i>	<i>R. flammula</i>	<i>R. conglomeratus</i>
<i>Mnium hornum</i>	<i>R. hederaceus</i>	<i>R. sanguineus</i>
<i>Plagiomnium undulatum</i>	<i>R. aquatilis sens. lat.</i>	<i>R. maritimus</i>
<i>Leptodictyum riparium</i>	<i>Ulmus glabra</i>	<i>Salix fragilis</i>
<i>Calliergonella cuspidata</i>	<i>Urtica dioica</i>	<i>S. alba</i>
<i>Brachythecium rutabulum</i>	<i>Alnus glutinosa</i>	<i>S. purpurea</i>
<i>B. rivulare</i>	<i>Chenopodium rubrum</i>	<i>S. viminalis</i>
<i>Eurhynchium praelongum</i>	<i>Stellaria graminea</i>	<i>S. caprea</i>
<i>E. hians</i>	<i>S. uliginosa</i>	<i>S. cinerea ssp. oleifolia</i>
<i>E. speciosum</i>	<i>Sagina procumbens</i>	<i>S. aurita</i>
<i>Plagiothecium denticulatum</i>	<i>Lychnis flos-cuculi</i>	<i>Rorippa sylvestris</i>
<i>Dryopteris dilatata</i>	<i>Persicaria amphibia</i>	<i>Cardamine pratensis</i>
<i>Nuphar lutea</i>	<i>P. maculosa</i>	<i>C. flexuosa</i>
<i>Caltha palustris</i>	<i>P. hydropiper</i>	<i>Lysimachia nemorum</i>
<i>Ranunculus repens</i>	<i>Rumex acetosa</i>	<i>L. nummularia</i>

L. vulgaris
Chrysosplenium oppositifolium
Filipendula ulmaria
Rubus fruticosus agg.
Potentilla anserina
P. erecta
Geum rivale
G. urbanum
Crataegus monogyna
Lotus corniculatus
L. pedunculatus
Trifolium repens
Lythrum salicaria
L. portula
Epilobium hirsutum
E. parviflorum
E. palustre
Chamerion angustifolium
Acer pseudoplatanus
Hydrocotyle vulgaris
Berula erecta
Apium nodiflorum
Angelica sylvestris
Solanum dulcamara
Myosotis scorpioides
M. secunda
M. laxa
Stachys sylvatica
S. palustris

Scutellaria galericulata
Ajuga reptans
Prunella vulgaris
Lycopus europaeus
Mentha × *verticillata*
M. aquatica
Callitriche stagnalis
Plantago major
P. lanceolata
Veronica serpyllifolia
V. beccabunga
V. catenata
V. persica
Galium palustre
Sambucus nigra
Viburnum opulus
Succisa pratensis
Cirsium palustre
C. arvense
Centaurea nigra
Taraxacum officinale agg.
Bellis perennis
Senecio jacobaea
S. aquaticus
Bidens cernua
B. tripartita
Potamogeton pectinatus
Zannichellia palustris
Lemna minor

Juncus bufonius
J. articulatus
J. acutiflorus
J. inflexus
J. effusus
J. conglomeratus
Carex paniculata
C. remota
C. hirta
C. acutiformis
C. riparia
C. rostrata
C. panicea
Festuca rubra
Lolium perenne
Poa pratensis
Glyceria maxima
G. fluitans
Deschampsia cespitosa
Holcus lanatus
H. mollis
Phalaris arundinacea
Agrostis stolonifera
Calamagrostis canescens
Phleum bertolonii
Phragmites australis
Sparganium erectum
Typha angustifolia
Iris pseudacorus

□ Habitat map by Wigginton *et al.* 1979



H = *Hydrodictyon* sp. N = *Nuphar lutea*; Pp = *Potamogeton pectinatus*; Z = *Zannichellia palustris*; solid black = *Typha angustifolia*; Horizontal stripes = *Phragmites australis*.

In June 1980 Will Prestwood surveyed the grassland at the western end of the mere and made a list of 58 species, which is given below. This includes a few new species for the site, such as *Valeriana dioica* (curiously not recorded since)

□ Species recorded by Prestwood in 1980

<i>Caltha palustris</i>	<i>Stachys officinalis</i>	<i>Lemna trisulca</i>
<i>Ranunculus sceleratus</i>	<i>S. palustris</i>	<i>Juncus conglomeratus</i>
<i>R. flammula</i>	<i>Scutellaria galericulata</i>	<i>Eleocharis palustris</i>
<i>Stellaria uliginosa</i>	<i>Ajuga reptans</i>	<i>Schoenoplectus lacustris</i>
<i>Sagina procumbens</i>	<i>Lycopus europaeus</i>	<i>Carex acutiformis</i>
<i>Lychnis flos-cuculi</i>	<i>Mentha aquatica</i>	<i>C. panicea</i>
<i>Rumex hydrolapathum</i>	<i>Callitriche stagnalis</i>	<i>C. viridula</i> ssp. <i>oedocarpa</i>
<i>Hottonia palustris</i>	<i>Veronica officinalis</i>	<i>C. pulicaris</i>
<i>Lysimachia nummularia</i>	<i>V. scutellata</i>	<i>Briza media</i>
<i>Filipendula ulmaria</i>	<i>Rhinanthus minor</i>	<i>Glyceria maxima</i>
<i>Potentilla anserina</i>	<i>Galium palustre</i>	<i>Glyceria</i> × <i>pedicellata</i>
<i>P. erecta</i>	<i>G. verum</i>	<i>Deschampsia cespitosa</i>
<i>Geum rivale</i>	<i>Valeriana officinalis</i>	<i>D. flexuosa</i>
<i>Lotus pedunculatus</i>	<i>V. dioica</i>	<i>Alopecurus geniculatus</i>
<i>Lathyrus pratensis</i>	<i>Succisa pratensis</i>	<i>Danthonia decumbens</i>
<i>Erodium cicutarium</i>	<i>Cirsium dissectum</i>	<i>Sparganium erectum</i>
<i>Hydrocotyle vulgaris</i>	<i>Senecio aquaticus</i>	<i>Iris pseudacorus</i>
<i>Oenanthe fistulosa</i>	<i>Alisma plantago-aquatica</i>	<i>Dactylorhiza</i> sp.
<i>Apium nodiflorum</i>	<i>Triglochin palustre</i>	
<i>Angelica sylvestris</i>	<i>Potamogeton</i> sp.	

Later that year Roger Hill, ecologist with Staffordshire County Council, surveyed some of the fields to the west of the mere. He used a numbering system that is now obscure, and a methodology that consisted of making short lists of notable species in each field or ditch. His surveys were on the 8th August and 27th September 1980. The intention seems to have been to enable a conservation assessment of each field and ditch, possibly to enable wildlife site boundaries to be drawn; but it is a particularly useful technique, as some of the lists degenerate into vague impressions. Ditch 'r', for example, is described as 'fairly varied' and we are informed that it contains *Carex* and *Mentha*. For the purposes of this report, Hill's lists have been aggregated into a single list of 111 species (ignoring vague taxa such as *Equisetum* sp.), which includes some good finds as well as a few records that should perhaps be described as dubious. *Plantago media* and *Galium uliginosum* are best considered unconfirmed, and the *Carex flava* agg. is most likely to be *C. viridula* ssp. *oedocarpa*, which he also recorded.

□ Species recorded by Hill in 1980

<i>Equisetum telmateia</i>	<i>R. obtusifolius</i>	<i>E. palustre</i>
<i>Caltha palustris</i>	<i>Hypericum tetrapterum</i>	<i>Hydrocotyle vulgaris</i>
<i>Ranunculus acris</i>	<i>Rorippa nasturtium-aquaticum</i>	<i>Berula erecta</i>
<i>R. repens</i>	<i>Cardamine pratensis</i>	<i>Apium nodiflorum</i>
<i>R. sceleratus</i>	<i>Lysimachia nummularia</i>	<i>Angelica sylvestris</i>
<i>R. lingua</i>	<i>L. vulgaris</i>	<i>Torilis japonica</i>
<i>R. flammula</i>	<i>Filipendula ulmaria</i>	<i>Myosotis scorpioides</i>
<i>R. aquatilis</i>	<i>Potentilla palustris</i>	<i>M. laxa</i>
<i>R. peltatus</i>	<i>P. anserina</i>	<i>Stachys officinalis</i>
<i>Thalictrum flavum</i>	<i>P. erecta</i>	<i>S. sylvatica</i>
<i>Urtica dioica</i>	<i>P. reptans</i>	<i>S. palustris</i>
<i>Corylus avellana</i>	<i>Geum rivale</i>	<i>Scutellaria galericulata</i>
<i>Stellaria graminea</i>	<i>Prunus spinosa</i>	<i>Ajuga reptans</i>
<i>S. uliginosa</i>	<i>Crataegus monogyna</i>	<i>Prunella vulgaris</i>
<i>Cerastium fontanum</i>	<i>Lotus pedunculatus</i>	<i>Lycopus europaeus</i>
<i>Lychnis flos-cuculi</i>	<i>Lathyrus pratensis</i>	<i>Mentha aquatica</i>
<i>Persicaria amphibia</i>	<i>Trifolium pratense</i>	<i>Callitriche</i> sp.
<i>P. maculosa</i>	<i>Lythrum salicaria</i>	[<i>Plantago media</i>]
<i>P. hydropiper</i>	<i>Epilobium hirsutum</i>	<i>P. lanceolata</i>
<i>Rumex acetosa</i>	<i>E. parviflorum</i>	<i>Veronica scutellata</i>
<i>R. hydrolapathum</i>	<i>E. tetragonum</i>	<i>V. beccabunga</i>
<i>R. sanguineus</i>	<i>E. roseum</i>	<i>V. anagallis-aquatica</i>

<i>V. catenata</i>	<i>Juncus bufonius</i>	<i>Glyceria maxima</i>
<i>Odontites vernus</i>	<i>J. subnodulosus</i>	<i>G. fluitans</i>
[<i>Galium uliginosum</i>]	<i>J. articulatus</i>	<i>G. notata</i>
<i>G. palustre</i>	<i>J. acutiflorus</i>	<i>Deschampsia cespitosa</i>
<i>Valeriana officinalis</i>	<i>J. conglomeratus</i>	<i>Holcus lanatus</i>
<i>Succisa pratensis</i>	<i>Eleocharis palustris</i>	<i>Phalaris arundinacea</i>
<i>Cirsium dissectum</i>	<i>Isolepis setacea</i>	<i>Agrostis capillaris</i>
<i>C. palustre</i>	<i>Carex riparia</i>	<i>Alopecurus pratensis</i>
<i>Cirsium arvense</i>	<i>C. pseudocyperus</i>	<i>A. geniculatus</i>
<i>Centaurea nigra</i>	<i>C. panicea</i>	<i>Phleum pratense</i>
<i>Senecio aquaticus</i>	<i>C. flava</i> agg.	<i>Molinia caerulea</i>
<i>Bidens cernua</i>	<i>C. viridula</i> ssp. <i>oedocarpa</i>	<i>Phragmites australis</i>
<i>Alisma plantago-aquatica</i>	<i>Lolium perenne</i>	<i>Sparganium erectum</i>
<i>Triglochin palustre</i>	<i>Cynosurus cristatus</i>	<i>Typha latifolia</i>
<i>Lemna trisulca</i>	<i>Briza media</i>	<i>Iris pseudacorus</i>

In 1982 Mike Furness undertook a Phase 1 survey of the habitats at Aqualate and made notes on some of the species, adding one or two taxa to the site list, which are mentioned in the annotated species list below; but in general it adds little to the information we have about the site. His record of *Equisetum sylvaticum* was probably an error.

In 1984 Colin Hayes produced a map showing the locations of rare species around the site. It extends well beyond the current NNR boundary, most notably around Thistleyfield Covert to the north, and it included The Spectacles area, which was only added to the NNR in 2002.

☐ Rare plant locations recorded by Hayes in 1984

<i>Equisetum telmateia</i>	SJ75992124
<i>Thalictrum flavum</i>	SJ76272078
<i>Hypericum elodes</i>	SJ76981995
<i>Hottonia palustris</i>	SJ76342065, SJ76072065, SJ76352046 & SJ76092040
<i>Lysimachia vulgaris</i>	SJ76242076
<i>Samolus valerandi</i>	SJ77452008
<i>Geum rivale</i>	SJ77172133
<i>Agrimonia eupatoria</i>	SJ76142064
<i>Acer campestre</i>	SJ77062126
<i>Oenanthe fistulosa</i>	SJ76042065
<i>Veronica anagallis-aquatica</i>	SJ76062085
<i>Cirsium dissectum</i>	SJ763205 & SJ762204
<i>Eupatorium cannabinum</i>	SJ77112149
<i>Schoenoplectus lacustris</i>	SJ76062019
<i>Carex curta</i>	SJ76931998

In 1985 K.R. Stevenson and Ms M. Nixon recorded some quadrats at Aqualate, apparently as part of a grassland survey. Their results are included in the section on phytosociology below. Their records of *Cerastium arvense* and *Carex spicata* are probably errors.

The Biological Records Centre has details of a survey conducted by Margaret Palmer, a freshwater ecologist at the Nature Conservancy Council, in 1986. There is also a survey on the Standing Waters Database maintained by Scottish Natural Heritage of an anonymous survey on 30th June of that year. The latter includes a record of *Pilularia globulifera* which, if these two surveys are the same, has presumably been rejected by the BRC. That decision seems reasonable in the absence of any evidence. Palmer's other records are reasonable enough, but they add nothing to the site list.

□ Species recorded by Palmer in 1984

<i>Caltha palustris</i>	<i>Angelica sylvestris</i>	<i>J. effusus</i>
<i>Urtica dioica</i>	<i>Solanum dulcamara</i>	<i>Eleocharis palustris</i>
<i>Lychnis flos-cuculi</i>	<i>Myosotis scorpioides</i>	<i>Carex paniculata</i>
<i>Persicaria amphibia</i>	<i>Scutellaria galericulata</i>	<i>C. acutiformis</i>
<i>Rumex hydrolapathum</i>	<i>Mentha aquatica</i>	<i>C. riparia</i>
<i>Filipendula ulmaria</i>	<i>Veronica beccabunga</i>	<i>C. elata</i>
<i>Potentilla anserina</i>	<i>Galium palustre</i>	<i>Agrostis stolonifera</i>
<i>Lotus pedunculatus</i>	<i>Valeriana officinalis</i>	<i>Phragmites australis</i>
<i>Lythrum salicaria</i>	<i>Cirsium palustre</i>	<i>Typha angustifolia</i>
<i>Epilobium hirsutum</i>	<i>Juncus inflexus</i>	<i>Iris pseudacorus</i>

In 1989 John Martin undertook a second Phase 1 type survey and produced a site summary from his own fieldwork and from information already on file. This is slightly unsatisfactory, as it is uncertain whether the species were actually seen in 1989 or not. Most of his records are uncontroversial, but it is interesting to note that he is the only person to have recorded Alder Buckthorn, *Frangula alnus*. Unfortunately it is not one of the plants for which he gave a detailed location; but it would be worth looking out for in future, in areas of woodland or fen over peat.

On 14th August 2000 a consultant, Dr Elaine Radford, surveyed The Spectacles area, which has recently been added to the reserve. Her list of 99 species is quite thorough, and includes a new locality for *Cynoglossum officinale*. She added *Riccia fluitans* to the site list, and was credited in *Watsonia* vol. 24 with the discovery of *Hypericum elodes* in Staffordshire, although there the grid reference is given wrongly and the plant had in fact been known at Aqualate since at least 1984, as it appears on Hayes's map.

□ Species recorded at The Spectacles by Radford in 2000

<i>Lophocolea bidentata</i>	<i>R. hederaceus</i>	<i>Potentilla erecta</i>
<i>Marchantia polymorpha</i>	<i>Urtica dioica</i>	<i>Crataegus monogyna</i>
<i>Riccia fluitans</i>	<i>Fagus sylvatica</i>	<i>Lotus corniculatus</i>
<i>Sphagnum squarrosum</i>	<i>Castanea sativa</i>	<i>L. pedunculatus</i>
<i>S. fallax</i>	<i>Quercus robur</i>	<i>Lathyrus linifolius</i>
<i>Polytrichum commune</i>	<i>Betula pendula</i>	<i>Trifolium repens</i>
<i>Dicranella heteromalla</i>	<i>Alnus glutinosa</i>	<i>Epilobium palustre</i>
<i>Aulacomnium androgynum</i>	<i>A. incana</i>	<i>Aesculus hippocastanum</i>
<i>Calliergonella cuspidata</i>	<i>Stellaria media</i>	<i>Hydrocotyle vulgaris</i>
<i>Brachythecium rutabulum</i>	<i>S. graminea</i>	<i>Solanum dulcamara</i>
<i>Scleropodium purum</i>	<i>S. uliginosa</i>	<i>Myosotis laxa</i>
<i>Eurhynchium praelongum</i>	<i>Cerastium fontanum</i>	<i>Cynoglossum officinale</i>
<i>Hypnum cupressiforme</i>	<i>Sagina procumbens</i>	<i>Scutellaria galericulata</i>
<i>Rhytidiadelphus squarrosus</i>	<i>Persicaria hydropiper</i>	<i>Glechoma hederacea</i>
	<i>Rumex acetosella</i>	<i>Prunella vulgaris</i>
<i>Pteridium aquilinum</i>	<i>R. acetosa</i>	<i>Lycopus europaeus</i>
<i>Athyrium filix-femina</i>	<i>Hypericum elodes</i>	<i>Callitriche</i> sp.
<i>Dryopteris dilatata</i>	<i>Viola riviniana</i>	<i>Digitalis purpurea</i>
<i>Sequoia sempervirens</i>	<i>Salix cinerea</i>	<i>Veronica serpyllifolia</i> ssp.
<i>Nuphar lutea</i>	<i>Cardamine pratensis</i>	<i>serpyllifolia</i>
<i>Ranunculus repens</i>	<i>C. flexuosa</i>	<i>V. chamaedrys</i>
<i>R. flammula</i>		

<i>V. arvensis</i>	<i>Juncus bufonius</i>	<i>Lolium perenne</i>
<i>Campanula rotundifolia</i>	<i>J. articulatus</i>	<i>Cynosurus cristatus</i>
<i>Galium palustre</i>	<i>J. acutiflorus</i>	<i>Poa annua</i>
<i>G. verum</i>	<i>J. effusus</i>	<i>P. trivialis</i>
<i>G. saxatile</i>	<i>Luzula campestris</i>	<i>Deschampsia cespitosa</i>
<i>Cirsium vulgare</i>	<i>Isolepis setacea</i>	<i>Holcus lanatus</i>
<i>C. arvense</i>	<i>Carex paniculata</i>	<i>Anthoxanthum odoratum</i>
<i>Hypochaeris radicata</i>	<i>C. ovalis</i>	<i>Agrostis capillaris</i>
<i>Leontodon autumnalis</i>	<i>C. hirta</i>	<i>A. stolonifera</i>
<i>Pilosella officinarum</i>	<i>C. acutiformis</i>	<i>A. canina</i>
<i>Achillea millefolium</i>	<i>C. nigra</i>	<i>Alopecurus pratensis</i>
<i>Senecio jacobaea</i>	<i>Nardus stricta</i>	<i>Typha latifolia</i>
<i>Bidens cernua</i>	<i>Festuca rubra</i>	
<i>Potamogeton natans</i>	<i>F. ovina</i>	

On 18th August 2001 Ian Hopkins surveyed the vicinity of Aqualate as part of the ongoing Flora of Staffordshire project, and on 3rd June 2002 he was joined by the BSBI county recorder John Hawksford for a second visit. The lists they made include some 193 taxa and constituted by far the most thorough botanical survey to date. Most of their records are localised only to grid square (usually 1km or tetrad) but they gave the more uncommon species 8-figure grid references (10m squares). Several of the species they recorded are new, most notably perhaps the introduced species *Impatiens capensis*, Orange Balsam, which is now well established in a variety of habitats around the entire site. It does not dominate the vegetation, though, so presents no threat to any native species.

The record of *Carex acuta*, Slender Tufted-sedge, seems out of place, and I queried it with John Hawksford, who replied as follows: 'Weather conditions were difficult, with rain, on June 3rd. Ian recorded it at 780201, "wet ditch marked on OS map between the Mere and a path, 780201 (near *Calamagrostis canescens*)"; I wasn't sure about it: it seemed sterile and I suspected a hybrid. On June 21st, I was more confident about plants seen "near *Carex vesicaria*" at 77112095. We note that you appear (in *Rare Plants of Shropshire*) to be rather sceptical about claims for this species, so perhaps we were wrong.'

It is probably best to consider this unconfirmed for now, but to make an effort to look again for this species in the near future. The survey in 2005 took place too late in the year to be able to record this species. Their full list is given below.

□ Species recorded by Hopkins & Hawksford in 2001 & 2002

<i>Equisetum fluviatile</i>	<i>Quercus petraea</i>	<i>Tilia</i> × <i>europaea</i>
<i>E. palustre</i>	<i>Betula pendula</i>	<i>Malva moschata</i>
<i>Polypodium vulgare</i>	<i>Chenopodium rubrum</i>	<i>Viola riviniana</i>
<i>Pteridium aquilinum</i>	<i>Atriplex prostrata</i>	<i>V. arvensis</i>
<i>Athyrium filix-femina</i>	<i>Moehringia trinervia</i>	<i>Rorippa nasturtium-aquaticum</i>
<i>Dryopteris affinis</i>	<i>Stellaria holostea</i>	<i>R. palustris</i>
<i>D. carthusiana</i>	<i>S. graminea</i>	<i>Cardamine amara</i>
<i>D. dilatata</i>	<i>S. uliginosa</i>	<i>C. pratensis</i>
<i>Larix kaempferi</i>	<i>Sagina procumbens</i>	<i>C. flexuosa</i>
<i>Pinus sylvestris</i>	<i>S. apetala</i> ssp. <i>erecta</i>	<i>Erophila verna</i>
<i>Nuphar lutea</i>	<i>Lychnis flos-cuculi</i>	<i>Rhododendron ponticum</i>
<i>Caltha palustris</i>	<i>Persicaria hydropiper</i>	<i>Hottonia palustris</i>
<i>Ranunculus acris</i>	<i>Fallopia japonica</i>	<i>Lysimachia nemorum</i>
<i>R. lingua</i>	<i>Rumex acetosella</i>	<i>L. nummularia</i>
<i>R. flammula</i> ssp. <i>flammula</i>	<i>R. hydrolapathum</i>	<i>L. vulgaris</i>
<i>R. hederaceus</i>	<i>R. maritimus</i>	<i>Samolus valerandi</i>
<i>Thalictrum flavum</i>	<i>Hypericum maculatum</i> ssp.	<i>Philadelphus coronarius</i>
<i>Urtica urens</i>	<i>obtusiusculum</i>	<i>Ribes rubrum</i>
<i>Fagus sylvatica</i>	<i>H. tetrapterum</i>	<i>Chrysosplenium oppositifolium</i>
<i>Castanea sativa</i>	<i>H. humifusum</i>	<i>Potentilla palustris</i>

<i>P. erecta</i>	<i>Teucrium scorodonia</i>	<i>J. inflexus</i>
<i>P. reptans</i>	<i>Ajuga reptans</i>	<i>J. conglomeratus</i>
<i>Agrimonia eupatoria</i>	<i>Prunella vulgaris</i>	<i>Luzula campestris</i>
<i>Aphanes australis</i>	<i>Lycopus europaeus</i>	<i>L. multiflora</i> ssp. <i>multiflora</i>
<i>Prunus domestica</i> ssp. <i>insititia</i>	<i>Mentha arvensis</i>	<i>Eleocharis palustris</i> ssp. <i>vulgaris</i>
<i>Prunus padus</i>	<i>M. aquatica</i>	<i>Schoenoplectus</i>
<i>Sorbus aucuparia</i>	<i>Callitriche stagnalis</i>	<i>tabernaemontani</i>
<i>Lotus corniculatus</i>	<i>Scrophularia nodosa</i>	<i>Isolepis setacea</i>
<i>L. pedunculatus</i>	<i>S. auriculata</i>	<i>Carex otrubae</i>
<i>Medicago lupulina</i>	<i>Veronica serpyllifolia</i> ssp.	<i>C. disticha</i>
<i>Trifolium dubium</i>	<i>serpyllifolia</i>	<i>C. remota</i>
<i>T. pratense</i>	<i>V. officinalis</i>	<i>C. ovalis</i>
<i>T. striatum</i>	<i>V. montana</i>	<i>C. hirta</i>
<i>Ulex europaeus</i>	<i>V. scutellata</i>	<i>C. acutiformis</i>
<i>Myriophyllum spicatum</i>	<i>V. catenata</i>	<i>C. pseudocyperus</i>
<i>Lythrum salicaria</i>	<i>V. arvensis</i>	<i>C. rostrata</i>
<i>Epilobium parviflorum</i>	<i>Odontites vernus</i> ssp. <i>serotinus</i>	<i>C. vesicaria</i>
<i>E. obscurum</i>	<i>Rhinanthus minor</i>	<i>C. flacca</i>
<i>Chamerion angustifolium</i>	<i>Campanula rotundifolia</i>	<i>C. panicea</i>
<i>Circaea lutetiana</i>	<i>Galium palustre</i>	<i>C. pilulifera</i>
<i>Cornus sericea</i>	<i>G. verum</i>	<i>C. acuta</i>
<i>Ilex aquifolium</i>	<i>G. saxatile</i>	<i>C. nigra</i>
<i>Aesculus hippocastanum</i>	<i>Viburnum opulus</i>	<i>C. elata</i>
<i>Acer pseudoplatanus</i>	<i>Valeriana officinalis</i>	<i>Festuca pratensis</i>
<i>Oxalis acetosella</i>	<i>Succisa pratensis</i>	<i>F. arundinacea</i>
<i>Geranium pusillum</i>	<i>Cirsium dissectum</i>	<i>F. rubra</i> ssp. <i>rubra</i>
<i>Erodium cicutarium</i>	<i>C. palustre</i>	<i>F. ovina</i> ssp. <i>ovina</i>
<i>Impatiens capensis</i>	<i>Hypochaeris radicata</i>	<i>Vulpia bromoides</i>
<i>Hydrocotyle vulgaris</i>	<i>Taraxacum officinale</i> agg.	<i>Cynosurus cristatus</i>
<i>Conopodium majus</i>	<i>Pilosella officinarum</i>	<i>Briza media</i>
<i>Berula erecta</i>	<i>Bellis perennis</i>	<i>Poa trivialis</i>
<i>Oenanthe fistulosa</i>	<i>Tripleurospermum inodorum</i>	<i>P. pratensis</i>
<i>Apium nodiflorum</i>	<i>Senecio aquaticus</i>	<i>Glyceria maxima</i>
<i>Convolvulus arvensis</i>	<i>S. erucifolius</i>	<i>G. notata</i>
<i>Calystegia sepium</i>	<i>S. vulgaris</i> var. <i>vulgaris</i>	<i>Holcus mollis</i>
<i>Nymphoides peltata</i>	<i>Bidens cernua</i>	<i>Aira caryophyllea</i>
<i>Myosotis scorpioides</i>	<i>B. tripartita</i>	<i>Anthoxanthum odoratum</i>
<i>M. laxa</i>	<i>Alisma plantago-aquatica</i>	<i>Agrostis capillaris</i>
<i>M. arvensis</i>	<i>Triglochin palustre</i>	<i>Danthonia decumbens</i>
<i>M. discolor</i>	<i>Potamogeton natans</i>	<i>Molinia caerulea</i>
<i>Cynoglossum officinale</i>	<i>Lemna gibba</i>	<i>Typha latifolia</i>
<i>Lamiastrum galeobdolon</i> ssp.	<i>L. trisulca</i>	<i>T. angustifolia</i>
<i>montanum</i>	<i>Juncus squarrosus</i>	<i>Iris pseudacorus</i>
<i>Galeopsis tetrahit</i>	<i>J. bufonius</i>	<i>Dactylorhiza praetermissa</i>
<i>G. bifida</i>	<i>J. articulatus</i>	
<i>Scutellaria galericulata</i>	<i>J. acutiflorus</i>	

The current survey

The NNR was surveyed on 10th, 11th & 25th August and 11th September 2005 by A.J. Lockton. A full species list was made of all vascular plants seen, and specimens were taken for determination where necessary. Bryophytes were recorded when present in quadrats or where they formed a significant part of the vegetation. Specimens were collected where necessary and sent to the BBS county recorder Martin Godfrey or to Nick Hodgetts for determination. All the species recorded (251 taxa) are included in the list below, which is annotated with information on their distribution and abundance.

An overall impression of the site this year was of neglect within the NNR boundary. Many former agricultural fields have succeeded to swamp and carr, and the margins of the mere are almost entirely ungrazed and overgrown. Although there was an algal bloom in the mere, there was not much sign of eutrophication in the vegetation generally.

One species that was added to the site list this year is Fen Nettle *Urtica galeopsifolia*. This taxon is not accepted by some authors (e.g. Stace 1997), but it is by many field botanists. It is believed to be a plant of less eutrophic conditions than *U. dioica*, which is of some significance to our understanding of the vegetation at Aqualate Mere, where otherwise mesotrophic vegetation sometimes contains large quantities of this herb. For the purposes of vegetation analysis, it has been left out because it is not recorded in the NVC.

Quadrats were recorded in a range of vegetation types and are presented in the section on phytosociology below.

- *Urtica galeopsifolia* in *Calamagrostis canescens* grassland east of the mere. Note the narrow leaves and absence of indicators of eutrophication, such as *Galium aparine* and *Calystegia sepium*.



Annotated Species List

Showing all species recorded at Aqualate Mere. Where we have not found a species this year, the report is enclosed by square brackets. This is not meant to imply an erroneous record or that the species in question has necessarily gone from the site. Any likely errors are explained in the text. Where we have recorded a species, previous records are generally omitted, and details of its abundance and distribution are given. The list is given in taxonomic order, following Blockeel & Long 1998 and Stace 1997.

Bryophytes

[*Lophocolea bidentata*. Recorded by Wigginton *et al.* in 1979 and by Radford in 2000.]

Chiloscyphus polyanthos. Recorded by Wigginton *et al.* in 1979.]

[*Marchantia polymorpha*. Recorded by Radford at The Spectacles in 2000.]

Riccia fluitans. In a pool at The Spectacles (specimen conf. N.G. Hodgetts).

Sphagnum squarrosum. Abundant in wet rush-pasture at The Spectacles.

[*S. fallax*. Recorded by Radford at The Spectacles in 2000.]

Polytrichum formosum. Occasional in woodland on Oak Hill.

P. commune. In flushes in grassland along the southern shore.

[*Dicranella heteromalla*. Recorded by Radford at The Spectacles in 2000.]

[*Leucobryum glaucum*. Recorded by Dickenson in 1798.]

Mnium hornum. Occasional in woodland.

Plagiomnium undulatum. Occasional.

[*Aulacomnium palustre*. Recorded by Dickenson in 1798.]

[*A. androgynum*. Recorded by Radford at The Spectacles in 2000.]

[*Leptodictyum riparium*. Recorded by Wigginton *et al.* in 1979.]

[*Drepanocladus aduncus*. Recorded by Dickenson in 1798.]

Calliergon cordifolium. In rush-pasture at The Spectacles (det. M.F. Godfrey).

Calliergonella cuspidata, Pointed Spear-moss. Frequent.

Brachythecium rutabulum. Occasional on trees, etc.

[*B. rivulare*. Recorded by Wigginton *et al.* in 1979.]

Scleropodium purum. Occasional in grassland.

Eurhynchium praelongum. Frequent throughout.

[*E. hians*. Recorded by Wigginton *et al.* in 1979.]

[*E. speciosum*. Recorded by Wigginton *et al.* in 1979.]

Plagiothecium denticulatum. Recorded by Wigginton *et al.* in 1979.]

[*Hypnum cupressiforme*. Recorded by Radford at The Spectacles in 2000.]

Rhytidiadelphus squarrosus. Occasional in grassland.

Vascular plants

Equisetaceae

Equisetum fluviatile, Water Horsetail. In a ditch to the west of the lake, at SJ765209.

E. arvense, Field Horsetail. Locally frequent in grassland and occasional in woods.

[*E. sylvaticum*, Wood Horsetail. Recorded by Furness in 1982, probably in error.]

E. palustre, Marsh Horsetail. Occasional in wet areas, including in grassland south of the mere.

E. telmateia, Great Horsetail. Abundant in the wet woodland below Oak Hill, at SJ777206. In 1984 Hayes recorded it along a ditch west of the mere (outside the NNR) at SJ75992124.

Osmundaceae

[*Osmunda regalis*, Royal Fern. Listed by Garner in 1844.]

Polypodiaceae

[*Polypodium vulgare*, Polypody. Recorded by Hopkins & Hawksford in 2002.]

Dennstaedtiaceae

Pteridium aquilinum, Bracken. Abundant in woods throughout.

Woodsiaceae

Athyrium filix-femina, Lady Fern. Occasional in wet grassland and woodland.

Dryopteridaceae

Dryopteris filix-mas, Common Male Fern. Occasional in all the woods.

D. affinis, Scaly Male Fern. Rare in woodland.

D. carthusiana, Narrow Buckler-fern. Occasional on peaty soils, e.g. in grassland on the south-east shore of the mere.

D. dilatata, Broad Buckler-fern. Frequent in woods, occasional in fens and wet grassland.

Pinaceae

- [*Picea abies*, Norway Spruce. Listed by Furness in 1982.]
Larix decidua, Larch. Planted in Boathouse Wood.
L. kaempferi, Japanese Larch. Several trees on the north side of Anc's Hill.
Pinus sylvestris, Scots Pine. Several trees along the south shore of the mere and in mixed woodland at Anc's Hill.

Taxodiaceae

- [*Sequoia sempervirens*, Coastal Redwood. Recorded by Radford at The Spectacles in 2000.]
Sequoiadendron giganteum, Wellingtonia. A few recently planted trees near the south shore.

Nymphaeaceae

- Nymphaea alba*, White Water-lily. Rare – only in the R. Meese, where it was first recorded by Fraser in 1864.
Nuphar lutea, Yellow Water-lily. More common than the previous species, around the outflow to the R. Meese and along the stream.

Ranunculaceae

- Caltha palustris*, Marsh Marigold. Occasional in wet grassland and fen.
Ranunculus acris, Meadow Buttercup. Occasional in grassland.
R. repens, Creeping Buttercup. Frequent throughout.
R. sceleratus, Celery-leaved Buttercup. Only seen along a ditch west of the mere this year; Stevenson & Nixon found it on the east shore of the mere in 1985.
[*R. lingua*, Greater Spearwort. First recorded by Garner "in a ditch on the north side of Aqualate Pool, 1838," and subsequently by Hill in 1980 and by Hopkins & Hawksford in 2002, in a ditch to the west of the mere at SJ76982098.]
R. flammula, Lesser Spearwort. Frequent in wet grassland and fen. All plants seem to be *R. flammula* ssp. *flammula*, as recorded by Hopkins in 2001.
[*R. hederaceus*, Ivy-leaved Crowfoot. Recorded by Wigginton *et al.* in 1979, by Radford (at The Spectacles) in 2000, and by Hopkins & Hawksford in 2002.
[*R. aquatilis*, Common Water Crowfoot. This was recorded *sensu lato* by Wigginton *et al.* in 1979 and by Hill in 1980.]
[*R. peltatus*, Pond Water-crowfoot. Recorded by Hill in 1980.]

- Thalictrum flavum*, Common Meadow-rue. In 1844 Garner found this species in "meadows on the north side of Aqualate Mere." It has since been recorded many times. Barker found it in fields to the west in 1975, as did Hill in 1980. Hayes mapped it at SJ76272078 in 1984, where it still was this year. Other locations where it has been found are SJ766208 (Martin 1989) and both SJ76582033 and SJ76292052 (Hopkins & Hawksford 2002).

Ulmaceae

- Ulmus glabra*, Wych Elm. Occasional in woods.

Urticaceae

- Urtica dioica*, Common Nettle. Occasional throughout, but rarely abundant.
U. galeopsifolia, Fen Nettle. Locally frequent in *Phragmites* swamp on the south-east side of the mere, ca. SJ77762002; scattered elsewhere around the mere. Hybrids with *U. dioica* are also present.
[*U. urens*, Small Nettle. Recorded by Furness in 1982 and by Hopkins in 2001. It was seen this year in fields just outside the NNR boundary (to the north-west).]

Myricaceae

- [*Myrica gale*, Bog Myrtle. Listed by Garner in 1844 and recorded by Fraser in 1864, but not seen since.]

Fagaceae

- Fagus sylvatica*, Beech. In the Deer Park.
Castanea sativa, Sweet Chestnut. Planted in woodland at Rough Hill & Sheep Hill.
[*Quercus petraea*, Sessile Oak. Recorded by Furness in 1982 and by Hopkins in 2001.]
Q. robur, Pedunculate Oak. Frequent in woods and hedges.

Betulaceae

- Betula pendula*, Silver Birch. Occasional in woods and grassland.
[*B. pubescens*, Downy Birch. Listed by Furness in 1982 and by Martin in 1989.]
Alnus glutinosa, Alder. Frequent.
[*A. incana*, Grey Alder. Recorded by Radford at The Spectacles in 2000.]
Corylus avellana, Hazel. Seen only at Oak Hill this year.

Chenopodiaceae

- Chenopodium rubrum*, Red Goosefoot. Rare, around the edge of the mere.

[*Atriplex prostrata*, Spear-leaved Orache.
Recorded by Hopkins & Hawksford in 2002.]

Portulacaceae

[*Claytonia sibirica*, Pink Purslane. Recorded by
Jennings & Jennings in 1973.]

Montia fontana, Blinks. Recorded by Jennings &
Jennings in 1973.]

Caryophyllaceae

[*Moehringia trinervia*, Three-nerved Sandwort.
Recorded by Eedes (1953), Jennings &
Jennings (1973) and Hopkins & Hawksford
(2002).]

Stellaria media, Common Chickweed. Frequent in
acid grassland south of the mere; rare
elsewhere.

[*S. holostea*, Greater Stitchwort. Recorded by
Jennings & Jennings (1973) and Hopkins &
Hawksford (2002).]

S. graminea, Lesser Stitchwort. Frequent in
grasslands.

S. uliginosa, Bog Stitchwort. Frequent.

[*Cerastium arvense*, Field Mouse-ear. Recorded by
Stevenson & Nixon in 1985. Best considered
unconfirmed.]

C. fontanum, Common Mouse-ear. Occasional.

Sagina procumbens, Procumbent Pearlwort.
Occasional.

[*S. apetala* ssp. *erecta*, Fringed Pearlwort.
Recorded by Hopkins in 2001 'on the surface
of a footpath' at SJ762205.]

Lychnis flos-cuculi, Ragged Robin. Occasional in
wet grassland and swamp throughout.

Silene dioica, Red Campion. Frequent in woods
and hedges.

Polygonaceae

Persicaria amphibibia, Amphibious Bistort.
Occasional around the mere and in wet
grassland.

P. maculosa, Redshank. Frequent.

P. lapathifolia, Pale Persicaria. Rare, in fields to
the west.

P. hydropiper, Water-pepper. Frequent.

Polygonum aviculare, Knotgrass. Rare, along
paths.

Fallopia japonica, Japanese Knotweed. Rare, near
the south-east shore.

Rumex acetosella, Sheep's Sorrel. Rare, in acid
grassland on the south shore and on a dry
bank west of the mere.

R. acetosa, Common Sorrel. Frequent in grassland.

R. hydrolapathum, Water Dock. Occasional
around the mere and along ditches.

R. crispus, Curled Dock. Occasional in grassland.

R. conglomeratus, Clustered Dock. Occasional in
grassland.

R. sanguineus, Wood Dock. Occasional in woods.

R. obtusifolius, Broad-leaved Dock. Occasional.

[*R. maritimus*, Golden Dock. Recorded by
Wigginton *et al.* in 1979 and by Hopkins in
2001: one plant on the shore at SJ770202.]

Clusiaceae

Hypericum perforatum, Perforate St. John's-wort.
Rare in grassland to the west of the mere.

[*H. maculatum* ssp. *obtusiusculum*, Imperforate
St. John's-wort. Recorded by Hopkins in 2001.]

H. tetrapterum, Square-stalked St. John's-wort.
Occasional in fields to the west.

[*H. humifusum*, Trailing St. John's-wort. Recorded
by Hopkins on the dry bank to the west of the
mere.]

H. elodes, Marsh St. John's-wort. Abundant
around the margin of one pool at The
Spectacles, SJ76981994, where it was first
recorded by Colin Hayes in 1984.

Tiliaceae

Tilia [×]*europaea*, Lime. One fine tree on the south
shore of the mere and several in woodland to
the west.

Malvaceae

[*Malva moschata*, Musk-mallow. Recorded in
2001 by Hopkins.]

M. sylvestris, Common Mallow. On the dry ridge
west of the mere.

Violaceae

[*Viola riviniana*, Common Dog-violet. Recorded by
Jennings & Jennings in 1973, Radford in 200,
and Hopkins in 2001.]

[*V. palustris*, Marsh Violet. Recorded by Stevenson
in 1985.]

[*V. arvensis*, Field Pansy. Recorded by Hopkins &
Hawksford in 2002.]

Salicaceae

[*Populus tremula*, Aspen. Listed by Furness in
1982.]

P. [×]*canadensis*, Hybrid Black Poplar. Several trees
in woodland by the Meese, at SJ761209.

Salix pentandra, Bay Willow. In scrub east of the
mere, at SJ78081994.

S. [×]*meyeriana* (*pentandra* [×] *fragilis*), Shiny-
leaved Willow. Rare, in a hedge east of the
mere, at SJ78051994.

S. fragilis, Crack Willow. Frequent.

S. alba, White Willow. Rare, in scrub east of the
mere, at SJ780199.

- S. purpurea*, Purple Willow. Occasional, along ditches and in scrub at both the west and east ends of the mere.
- S. viminalis*, Osier. Rare, in scrub at the east end of the mere, at SJ780199.
- S. ×smithiana* (*cinerea* × *viminalis*), Silky-leaved Osier. Occasional. Specimens were collected this year at SJ76422094 & SJ78082016.
- [*S. caprea*, Goat Willow. Recorded by Wigginton *et al.* in 1979 and Furness in 1982, but not seen this year.]
- S. cinerea*, Grey Willow. Frequent throughout. All plants appear to be *Salix cinerea* ssp. *oleifolia*, Rusty Sallow.
- [*S. aurita*, Eared Willow. Recorded by Wigginton *et al.* in 1979.]
- [*S. repens*, Creeping Willow. Recorded by Garner in 1844.]

Brassicaceae

- Alliaria petiolata*, Garlic Mustard. Rare, in hedges. [*Arabidopsis thaliana*, Thale Cress. Recorded by Jennings & Jennings in 1973.]
- Barbarea vulgaris*, Winter-cress. Rare, on the east shore of the mere.
- Rorippa nasturtium-aquaticum*, Water-cress. Occasional.
- [*R. palustris*, Marsh Yellow-cress. Recorded by Edees in 1953 and by Hopkins in 2001.]
- [*R. sylvestris*, Creeping Yellow-cress. Recorded by Wigginton *et al.* in 1979.]
- [*Cardamine amara*, Large Bitter-cress. Recorded by Jennings & Jennings in 1973, by Barker in 1975, and by Hopkins & Hawksford in 2002.]
- C. pratensis*, Cuckoo-flower. Occasional.
- C. flexuosa*, Wavy Bitter-cress. Occasional.
- [*Erophila verna*, Common Whitlowgrass. Recorded by Jennings & Jennings in 1973 and by Hopkins & Hawksford in 2002, at SJ76242059.]
- Capsella bursa-pastoris*, Shepherd's-purse. Occasional in fields to the west.

Ericaceae

- Rhododendron ponticum*, Rhododendron. Dominant in a wood to the south-east of the mere.

Primulaceae

- [*Primula vulgaris*, Primrose. Recorded by Jennings & Jennings in 1973.]
- Hottonia palustris*, Water-violet. Abundant in a ditch on the west side of the mere, ca. SJ763208. Hopkins & Hawksford found it in another ditch along the northern border of the NNR, ca. SJ769209, in 2002. It seems to have gone from a number of other localities west of

the mere, where it was recorded in the 1980s. It was first recorded by Dickenson in 1798, 'in a ditch in very boggy ground on the south side of Aqualate Meer.'

Lysimachia nemorum, Yellow Pimpernel. In woodland at Oak Hill.

L. nummularia, Creeping-Jenny. Occasional throughout.

L. vulgaris, Yellow Loosestrife. Occasional in *Phragmites* swamp, and there is a large stand on the south side of the mere at SJ772201.

[*Samolus valerandi*, Brookweed. Occurs on the south side of the mere, at SJ77472008, where it was most recently seen by Hopkins & Hawksford in 2002 ('about 50 plants'). The first record was by Fraser in 1864.]

Hydrangeaceae

[*Philadelphus coronarius*, Mock Orange. Recorded by Hopkins & Hawksford in 2002, in a wood on the north side of the mere, at SJ77402071.]

Grossulariaceae

Ribes rubrum, Red Currant. In wet woodland along the north shore.

R. nigrum, Black Currant. Occasional in *Phragmites* swamp.

Crassulaceae

Sedum album, White Stonecrop. On the footbridge over the Meese at SJ76432094.

Saxifragaceae

Chrysosplenium oppositifolium, Opposite-leaved Golden-saxifrage. Occasional in wet woodland along the north shore.

Rosaceae

Filipendula ulmaria, Meadowsweet. Frequent.

Rubus idaeus, Raspberry. Occasional in woods.

R. fruticosus agg., Bramble. Frequent.

[*Potentilla palustris*, Marsh Cinquefoil. Recorded by Barker (1975), Hill (1980) and Hopkins & Hawksford (2002).]

P. anserina, Silverweed. Frequent.

P. erecta, Tormentil. Frequent.

P. reptans, Creeping Cinquefoil. Occasional.

[*Geum rivale*, Water Avens. Listed by Wigginton (1979), Hill (1980), Prestwood (1980) and Hayes (1984). The latter found it outside the current NNR boundary, in woodland to the north.]

G. urbanum, Wood Avens. Occasional in woodland on the north side of the mere.

[*Agrimonia eupatoria*, Agrimony. Recorded by Hayes in 1984 and by Hopkins & Hawksford in

2002. Hayes mapped it on a field margin at the westernmost end of the site, at SJ76142014.]

[*Aphanes australis*, Slender Parsley-piert.

Recorded by Hopkins & Hawksford in 2002.]

Rosa arvensis, Field Rose. Occasional in woodland.

R. canina, Dog Rose. Occasional in hedges and scrub.

Prunus spinosa, Blackthorn. Occasional. There is a large stand of Blackthorn scrub at the west end of the site, SJ76202070.

[*P. domestica* ssp. *insititia*, Damson. Listed by Hopkins in 2001.]

[*P. avium*, Wild Cherry. Listed by Jennings & Jennings in 1973.]

[*P. padus*, Bird Cherry. Recorded by Hopkins & Hawksford in 2002.]

Sorbus aucuparia, Rowan. Occasional in woods.

Crataegus monogyna, Hawthorn. Frequent in hedges, etc.

Fabaceae

[*Astragalus glycyphyllos*, Wild Liquorice. Recorded by Fraser in 1864.]

Lotus corniculatus, Common Bird's-foot-trefoil. Occasional.

L. pedunculatus, Large Bird's-foot-trefoil. Frequent.

Vicia cracca, Tufted Vetch. Occasional in swamps in the fields west of the mere.

[*Lathyrus linifolius*, Bitter Vetch. Recorded by Radford at The Spectacles in 2000.]

Lathyrus pratensis, Meadow Vetchling. Occasional.

[*Medicago lupulina*, Black Medick. Recorded by Stevenson in 1985 and by Hopkins & Hawksford in 2002.]

Trifolium repens, White Clover. Frequent.

T. dubium, Lesser Trefoil. Occasional.

T. pratense, Red Clover. Occasional.

[*T. striatum*, Knotted Clover. Found by Hopkins & Hawksford in 2002 on the top of the grassy ridge at SJ760209.]

Ulex europaeus, Gorse. On a dry bank on the south side of the mere.

Haloragaceae

[*Myriophyllum verticillatum*, Whorled Water-milfoil. Recorded by Darby in 1844.]

[*M. spicatum*, Spiked Water-milfoil. Recorded by Hopkins & Hawksford in 2002 at SJ767210.]

Lythraceae

Lythrum salicaria, Purple-loosestrife. Frequent around the margin of the mere, on shingle and in *Phragmites* swamp.

[*L. portula*, Water Purslane. Recorded by Wigginton *et al.* on the east shore of the mere in 1979.]

Onagraceae

Epilobium hirsutum, Great Willowherb. Frequent.

E. parviflorum, Hoary Willowherb. Frequent.

[*E. tetragonum*, Square-stalked Willowherb. Recorded by Hill in 1980.]

E. obscurum, Short-fruited Willowherb. Occasional in the fen.

[*E. roseum*, Pale Willowherb. Recorded by Hill in 1980.]

E. ciliatum, American Willowherb. Occasional in reedswamp.

E. palustre, Marsh Willowherb. Locally frequent in wet grassland, reedswamp and fen.

Chamerion angustifolium, Rosebay Willowherb. Occasional in woods.

Circaea lutetiana, Enchanter's-nightshade. Frequent in woods.

Cornaceae

[*Cornus sericea*, Red-osier Dogwood. Recorded by Hopkins & Hawksford in 2002, in woodland on the south-east shore at SJ77632007.]

Celastraceae

[*Euonymus europaeus*, Spindle. Recorded by Fraser in 1864, 'on the north side in a hedge.']

Aquifoliaceae

Ilex aquifolium, Holly. Occasional in dry woods on the north side.

Euphorbiaceae

Mercurialis perennis, Dog's Mercury. Frequent in woods.

Rhamnaceae

[*Frangula alnus*, Alder Buckthorn. Recorded by J.P. Martin in 1989.]

Hippocastanaceae

[*Aesculus hippocastanum*, Horse-chestnut. Recorded by Radford at The Spectacles in 2000, and by Hopkins and Hawksford in 2002.]

Aceraceae

[*Acer campestre*, Field Maple. Recorded by Hayes in 1984, in woodland north of the NNR at SJ77062126.]

A. pseudoplatanus, Sycamore. Occasional in woods, etc.

Oxalidaceae

Oxalis acetosella, Wood-sorrel. Rare, in woodland.

Geraniaceae

Geranium pusillum, Small-flowered Crane's-bill.

Recorded by Hopkins and Hawksford in 2002.]

G. robertianum, Herb-robert. Occasional in woodland along the north shore.

[*Erodium cicutarium*, Common Stork's-bill.

Recorded by Prestwood in 1980 and by Hopkins and Hawksford in 2002.]

Balsaminaceae

Impatiens capensis, Orange Balsam. Frequent in reedswamp and wet grassland throughout. First recorded here in 2001 by Hopkins.

Araliaceae

Hedera helix ssp. *helix*, Common Ivy. Occasional in woods and hedges.

Apiaceae

Hydrocotyle vulgaris, Marsh Pennywort. Frequent in fields to the west of the mere.

[*Conopodium majus*, Pignut. Recorded by Hopkins and Hawksford in 2002.]

Berula erecta, Lesser Water-parsnip. Occasional in wet grassland and ditches; also in the *Phragmites australis* swamp around the mere.

Oenanthe fistulosa, Tubular Water-dropwort.

Locally frequent in several fields to the west of the mere.

O. crocata, Hemlock Water-dropwort. Rare, in woodland on the north shore, SJ77582060.

Apium nodiflorum, Fool's Water-cress. Less common than *B. erecta*. It occurs in a flush on the south shore at SJ77552005.

[*A. inundatum*, Lesser Marshwort. Recorded by Garner in 1844.]

Angelica sylvestris, Wild Angelica. Frequent throughout.

[*Torilis japonica*, Upright Hedge-parsley. Recorded by Hill in 1980.]

Solanaceae

Solanum dulcamara, Bittersweet. Frequent throughout.

Convolvulaceae

[*Convolvulus arvensis*, Field Bindweed. Recorded by Hopkins in 2001.]

Calystegia sepium, Great Bindweed. Occasional in reedswamp around the mere and in unmanaged fields.

Menyanthaceae

[*Nymphoides peltata*, Fringed Water-lily. Recorded by Hopkins and Hawksford in 2002.]

Boraginaceae

[*Pentaglottis sempervirens*, Green Alkanet.

Recorded by Jennings & Jennings in 1973.]

Myosotis scorpioides, Water Forget-me-not.

Occasional around the mere.

[*M. secunda*, Creeping Forget-me-not. Recorded by Wigginton *et al.* in 1979.]

M. laxa, Tufted Forget-me-not. Frequent throughout.

[*M. arvensis*, Field Forget-me-not. Recorded by Barker in 1975 in fields 3 & 6, and by Hopkins in 2001.]

[*M. discolor*, Changing Forget-me-not. Recorded by Edees in 1953, and by Hopkins & Hawksford in 2002 on the dry ridge west of the mere.]

[*Cynoglossum officinale*, Hound's-tongue.

Recorded by Fraser in 1864, and by Hopkins in 2001: 'some 20 plants around a rabbit warren' at SJ760209. This is outside the NNR. Radford also recorded it, at The Spectacles, in 2000.]

Lamiaceae

[*Stachys officinalis*, Betony. Recorded, independently, by Hill and Prestwood in 1980.]

[*S. sylvatica*, Hedge Woundwort. Recorded by Wigginton *et al.* in 1979 and by Hill in 1980.]

[*S. palustris*, Marsh Woundwort. Recorded by Wigginton *et al.* in 1979 and by Hill and Prestwood in 1980.]

Lamiastrum galeobdolon, Yellow Archangel.

Occasional in woodland north of the mere. All plants are *L. galeobdolon* ssp. *montanum*.

Galeopsis tetrahit, Common Hemp-nettle. Occasional.

G. bifida, Bifid Hemp-nettle. Occasional on peaty soils near the mere.

Scutellaria galericulata, Skullcap. Occasional throughout.

Teucrium scorodonia, Wood Sage. Occasional on the hills north of the mere.

[*Ajuga reptans*, Bugle. Recorded by Wigginton (1979), Hill (1980), Prestwood (1980) and Hopkins & Hawksford (2002).]

Glechoma hederacea, Ground-ivy. Occasional in woods, hedges, etc.

Prunella vulgaris, Selfheal. Occasional.

Lycopus europaeus, Gipsywort. Frequent in grassland, fen and swamps.

[*Mentha arvensis*, Corn Mint. Recorded by Barker in 1975 and by Hopkins in 2001.]

M. ×verticillata, Whorled Mint. A specimen was collected in a field to the west of the mere this

year, at SJ76362052. It was previously recorded by Wigginton in 1979.
M. aquatica, Water Mint. Frequent.

Callitrichaceae

Callitriche stagnalis, Common Water-starwort.
Occasional in woodland, and at The Spectacles.
C. obtusangula, Blunt-fruited Water-starwort.
Abundant in the Coley Brook at SJ78051994.

Plantaginaceae

Plantago major, Greater Plantain. Occasional on bare ground around the mere and along paths.
[*P. media*, Hoary Plantain. Recorded by Hill in 1980, possibly in error for the previous species.]
P. lanceolata, Ribwort Plantain. Occasional in dry grassland, as along the south side of the mere.

Oleaceae

Fraxinus excelsior, Ash. Occasional in woods.
Ligustrum vulgare, Wild Privet. Rare, in woods.

Scrophulariaceae

Scrophularia nodosa, Common Figwort. Rare, in a field SW of the mere.
S. auriculata, Water Figwort. Occasional in swamps and fen.
Digitalis purpurea, Foxglove. Rare, in dry grassland.
[*Veronica serpyllifolia*, Thyme-leaved Speedwell. Recorded by Wigginton *et al.* (1979), Radford (2000) and Hopkins (2001).]
[*V. officinalis*, Heath Speedwell. Recorded by Prestwood in 1980 and Hopkins in 2001.]
V. chamaedrys, Germander Speedwell. In dry grassland south of the mere.
V. montana, Wood Speedwell. In woodland north of the mere.
[*V. scutellata*, Marsh Speedwell. First recorded by Hill and Prestwood (independently) in 1980, and subsequently by Hopkins and Hawksford in 2001 and 2002. In was in fields to the west of the mere (which were heavily grazed at the time of the current survey).]
V. beccabunga, Brooklime. Occasional throughout.
[*V. anagallis-aquatica*, Blue Water-speedwell. Recorded by Hill (1980), Hayes (1984) and Martin (1989), in ditches at the western end of the NNR.]
[*V. catenata*, Pink Water-speedwell. First recorded by Edees in 1953, and subsequently by Wigginton (1979), Hill (1980), Martin (1989) and Hopkins (2001). No locations given except

by Wigginton, who found it on the eastern shore of the mere.]
[*V. arvensis*, Wall Speedwell. Recorded by Radford in 2000 and by Hopkins & Hawksford in 2002.]
[*V. persica*, Common Field-speedwell. Recorded by Wigginton *et al.* in 1979.]
Odontites vernus, Red Bartsia. Frequent in grassland and along tracks through fields west of the mere. All plants appear to be *O. vernus* ssp. *serotinus*.
[*Rhinanthus minor*, Yellow-rattle. Recorded by Prestwood in 1980 and Hopkins in 2001.]

Lentibulariaceae

[*Utricularia vulgaris*, Greater Bladderwort. Recorded by Garner in 1844.]

Campanulaceae

Campanula rotundifolia, Harebell. Locally frequent in dry grassland south of the mere.

Rubiaceae

[*Galium uliginosum*, Fen Bedstraw. Recorded by Hill in 1980.]
G. palustre, Common Marsh-bedstraw. Frequent throughout.
G. verum, Lady's Bedstraw. Occasional in short grassland.
G. saxatile, Heath Bedstraw. Rare in dry acid grassland, such as that to the south of the mere.
G. aparine, Cleavers. Occasional.

Caprifoliaceae

Sambucus nigra, Elder. Occasional in woods, hedges and swamps.
Viburnum opulus, Guelder-rose. Occasional in hedges and scrub.
Lonicera periclymenum, Honeysuckle. Locally frequent in woods.

Valerianaceae

Valeriana officinalis, Common Valerian. Frequent in swamps, wet grassland and fen.
[*V. dioica*, Marsh Valerian. Recorded by Prestwood in 1980.]

Dipsacaceae

Succisa pratensis, Devil's-bit Scabious. Frequent.

Asteraceae

Arctium minus, Lesser Burdock. Rare, in wood margins, etc.
Cirsium vulgare, Spear Thistle. Rare, in the fields west of the mere.

[*C. dissectum*, Meadow Thistle. First recorded by Garner in 1844, and subsequently many times, although it seems to have declined significantly. Fraser (1864) described it as being on the north side of the mere (presumably near Thistleyfield Covert); Stevenson (1985) saw it on the east side; but most recorders found it in the fields to the west. The most recent record was in 2001 (Hopkins, SJ763207), and it was not seen this year despite searches (although it was a bit late in the season).]

C. palustre, Marsh Thistle. Frequent throughout.

C. arvensis, Creeping Thistle. Rare.

[*Onopordum acanthium*, Cotton Thistle. Recorded at Aqualate Park by Garner in 1844, possibly outside the NNR.]

Centaurea nigra, Common Knapweed. Frequent in grassland.

Hypochaeris radicata, Cat's-ear. Occasional in grassland.

Leontodon autumnalis, Autumnal Hawkbit.

Occasional in dry grassland, as on the south side of the mere.

Sonchus arvensis, Perennial Sow-thistle. Rare, by tracks west of the mere.

S. asper, Prickly Sow-thistle. Occasional, on the margin of the mere.

[*Taraxacum officinale* agg., Dandelion. Recorded by Wigginton (1979), Stevenson (1985) and Hopkins (2001).]

[*Pilosella officinarum*, Mouse-ear-hawkweed. Recorded by Radford (2000) and Hopkins (2001).]

Gnaphalium uliginosum, Marsh Cudweed. Locally frequent along tracks and in fields west of the mere.

Bellis perennis, Daisy. Rare, in grassland.

Artemisia vulgaris, Mugwort. Rare, in a field to the east of the mere.

Achillea millefolium, Yarrow. Rare, in grassland.

Tripleurospermum inodorum, Scentless Mayweed. Occasional.

Senecio jacobaea, Common Ragwort. Occasional.

S. aquaticus, Marsh Ragwort. Frequent.

[*S. erucifolius*, Hoary Ragwort. Recorded by Hopkins & Hawksford in 2002 on a dry bank at SJ76992096.]

[*S. vulgaris*, Groundsel. Recorded by Hopkins in 2001.]

Bidens cernua, Nodding Bur-marigold. Occasional around the mere.

B. tripartita, Trifid Bur-marigold. Alongside a ditch west of the mere, at SJ763204, and on the east shore.

Eupatorium cannabinum, Hemp-agrimony. Rare, in woodland on the north side of the mere.

Alismataceae

[*Baldellia ranunculoides*, Lesser Water-plantain. Recorded by Garner in 1844.]

Alisma plantago-aquatica, Water-plantain. Locally frequent in ditches west of the mere.

Hydrocharitaceae

[*Hydrocharis morsus-ranae*, Frogbit. Listed by Garner in 1844. Edees (1972) considered this record doubtful, but it seems quite possible.]

Juncaginaceae

Triglochin palustre, Marsh Arrowgrass. Occasional in the fields to the west of the mere, where it was first recorded by Fraser in 1864.

Potamogetonaceae

[*Potamogeton natans*, Broad-leaved Pondweed. Recorded by Radford in 2000, and by Hopkins and Hawksford in 2002.]

[*P. compressus*, Grasswrack Pondweed. Collected by Druce in July and September 1925 (conf. Dandy & Taylor, **E & OXF**). This species is not otherwise known as a plant of the meres, and it might conceivably have arrived here from the nearby canal.]

P. pectinatus, Fennel Pondweed. Frequent in the mere, where it was first recorded by Wigginton *et al.* in 1979.

Zannichelliaceae

Zannichellia palustris, Horned Pondweed. First recorded by Wigginton *et al.* in 1979; it is still frequent in the mere.

Lemnaceae

Lemna gibba, Fat Duckweed. Abundant and very fine in a drain on the west side of the mere, SJ763204. First recorded here in 2001 (Hopkins).

L. minor, Common Duckweed. Occasional around the edge of the mere; abundant in some of the ditches.

L. trisulca, Ivy-leaved Duckweed. Locally abundant in some ditches to the west of the mere.

L. minuta, Least Duckweed. In a pond at The Spectacles and a ditch to the west of the mere.

Juncaceae

[*Juncus squarrosus*, Heath Rush. Listed by Hopkins & Hawksford in 2002.]

J. bufonius, Toad Rush. Frequent on the south shore of the mere, along tracks and in wet meadows.

- J. subnodulosus*, Blunt-flowered Rush. Abundant in the fields south and west of the mere.
- J. articulatus*, Jointed Rush. Occasional throughout.
- J. acutiflorus*, Sharp-flowered Rush. Frequent throughout.
- J. bulbosus*, Bulbous Rush. Rare, on the south shore of the mere.
- J. inflexus*, Hard Rush. Frequent throughout.
- J. effusus*, Soft Rush. Abundant throughout.
- J. conglomeratus*, Compact Rush. Occasional in fields of pasture.
- Luzula campestris*, Field Wood-rush. Rare, in dry grassland, for example on the south side of the mere.
- [*L. multiflora* ssp. *multiflora*, Heath Wood-rush. Recorded by Hopkins & Hawksford in 2002.]

Cyperaceae

- [*Eriophorum angustifolium*, Common Cottongrass. Recorded by Stokes in 1787, 'covering several acres' at Aqualate Mere.]
- Eleocharis palustris*, Common Spike-rush. Frequent around the mere and in wet grassland in the fields to the west. Hopkins recorded it as *E. palustris* ssp. *vulgaris* in 2001.
- Scirpus sylvaticus*, Wood Club-rush. Rare, on the edge of a field east of the mere.
- [*Schoenoplectus lacustris*, Common Club-rush. Recorded by Prestwood in 1980 and Hayes in 1984. The latter noted that it was in a ditch SW of the mere at SJ760201.]
- S. tabernaemontani*, Grey Club-rush. First recorded by Ian Hopkins on the south shore of the mere, at SJ772201, in 2001. It was still there this year (specimen collected).
- [*Isolepis setacea*, Bristle Club-rush. Recorded by Hill in fields to the west in 1980; by Radford at The Spectacles in 2000; and by Hopkins along the south shore in 2001.]
- Carex paniculata*, Greater Tussock-sedge. Locally frequent at The Spectacles and in ditches west of the mere.
- [*C. otrubae*, False Fox-sedge. Recorded by Edees in 1953 and Hopkins & Hawksford in 2001 & 2002.]
- [*C. spicata*, Spiked Sedge. Recorded by Stevenson in 1985, possibly in error for the preceding.]
- C. disticha*, Brown Sedge. Frequent in woodland, swamp and fen around the mere; rarely flowering.
- C. remota*, Remote Sedge. Occasional in woods.
- C. ovalis*, Oval Sedge. Occasional in grassland.
- C. curta*, White Sedge. First recorded by Dickenson in 1798 in 'boggy ground near Aqualate Mere.' This year there was just one small patch at The Spectacles, at SJ76941998.

- C. hirta*, Hairy Sedge. Frequent in grassland, etc.
- C. acutiformis*, Lesser Pond-sedge. Frequent in swamps and woods around the mere and in wet fields to the west.
- C. riparia*, Great Pond-sedge. Occasional, in ditches and similar places to the above.
- C. pseudocyperus*, Cyperus Sedge. Occasional in swamps and fen.
- C. rostrata*, Bottle Sedge. On the edge of a pool at The Spectacles.
- [*C. vesicaria*, Bladder-sedge. Recorded by Dickenson in 1798 and by Hopkins & Hawksford in 2002 at SJ77112095, which is in a field north of the mere.]
- [*C. flacca*, Glaucous Sedge. Recorded by Stevenson in 1985 and by Hopkins & Hawksford in 2002.]
- C. panicea*, Carnation Sedge. Frequent in fields west of the mere.
- C. viridula* ssp. *oedocarpa*, Common Yellow Sedge. Occasional in fields east of the mere.
- [*C. pallescens*, Pale Sedge. Recorded by Edees in 1953.]
- [*C. pilulifera*, Pill Sedge. Recorded by Hopkins in 2001 on a heathy bank south of the mere at SJ772201.]
- [*C. acuta*, Slender Tufted-sedge. Recorded by Hopkins & Hawksford in 2002 in two places: a ditch east of the mere at SJ780201, and in a field north of the mere at SJ77112095.]
- C. nigra*, Common Sedge. Locally frequent in wet grassland and fen.
- C. elata*, Tufted Sedge. In a ditch west of the mere, at SJ76322084. Previously recorded by Hopkins & Hawksford in the field north of the mere with the *Carex acuta* and *C. vesicaria*.
- [*C. pulicaris*, Flea Sedge. Recorded by Fraser in 1864 and by Prestwood in 1980.]

Poaceae

- [*Nardus stricta*, Mat-grass. Recorded by Radford in 2000 at The Spectacles.]
- [*Festuca pratensis*, Meadow Fescue. Recorded by Stevenson in 1985, by Martin in 1989, and by Hopkins & Hawksford in 20002.]
- F. arundinacea*, Tall Fescue. Occasional in fen around the mere.
- F. gigantea*, Giant Fescue. In woodland along the north side of the mere.
- F. rubra*, Red Fescue. Occasional.
- F. ovina*, Sheep's Fescue. In areas of short, dry grassland.
- Lolium perenne*, Perennial Rye-grass. Frequent in the more improved grassland; occasional elsewhere.
- [*Vulpia bromoides*, Squirrel-tail Fescue. Recorded by Hopkins & Hawksford in 2002.]

Cynosurus cristatus, Crested Dog's-tail. Frequent in grasslands.

[*Briza media*, Quaking-grass. Recorded by Hill (1980), Prestwood (1980) and Hopkins & Hawksford (2002).]

Poa annua, Annual Meadow-grass. Occasional along tracks, etc.

P. trivialis, Rough Meadow-grass. Occasional.

[*P. pratensis*, Smooth Meadow-grass. Recorded by Wigginton (1979), Stevenson (1985) and Hopkins & Hawksford (2002).]

Dactylis glomerata, Cock's-foot. Occasional.

Glyceria maxima, Reed Sweet-grass. Frequent in swamps and fen.

G. fluitans, Floating Sweet-grass. Occasional.

[*G. ×pedicellata*, Hybrid Sweet-grass. Recorded by Prestwood in 1980.]

[*G. notata*, Plicate Sweet-grass. Recorded by Hill in 1980 and by Hopkins & Hawksford in 2001 & 2002.]

Arrhenatherum elatius, False Oat-grass. Occasional in hedges and woodland edge.

Deschampsia cespitosa, Tufted Hair-grass. Locally frequent in damp fields.

D. flexuosa, Wavy Hair-grass. Rare, in dry grassland.

Holcus lanatus, Yorkshire-fog. Frequent throughout.

H. mollis, Creeping Soft-grass. Locally abundant in woods.

[*Aira caryophyllea*, Silver Hair-grass. Recorded in 2001 by Hopkins on a dry bank at SJ762209.]

Anthoxanthum odoratum, Sweet Vernal Grass. Occasional.

Phalaris arundinacea, Reed Canary-grass. Frequent.

Agrostis capillaris, Common Bent. Occasional, mostly in dry grassland.

A. stolonifera, Creeping Bent. Frequent.

A. canina, Velvet Bent. Frequent in wet grassland all around the mere.

[*Calamagrostis epigejos*, Wood Small-reed. Recorded by Dickenson on the south shore of the mere in 1798, and listed by Garner in 1844, but not recorded since.]

C. canescens, Purple Small-reed. First recorded here by Stokes in 1796, and many times subsequently. It occurs in considerable abundance along the south and west shores of the mere, in woods, fen and open grassland; rarely flowering this year.

Alopecurus pratensis, Meadow Foxtail. Occasional in grassland.

A. geniculatus, Marsh Foxtail. In fields north-west of the mere.

[*A. aequalis*, Orange Foxtail. Recorded by S.R. Price in 1979, possibly in error.]

Phleum pratense, Timothy. Frequent in grassland.

[*P. bertolonii*, Smaller Cat's-tail. Recorded by Wigginton *et al.* in 1979.]

Brachypodium sylvaticum, False-brome. Frequent in the woods north of the mere.

Elymus caninus, Bearded Couch. Rare, in wet woods on the north shore of the mere.

Danthonia decumbens, Heath-grass. Occasional in fields to the west of the mere.

Molinia caerulea, Purple Moor-grass. Abundant in fields around the mere.

Phragmites australis, Common Reed. Abundant around the mere, in swamps in fields to the west, and in wet woodland.

Sparganiaceae

Sparganium erectum, Branched Bur-reed. Occasional throughout.

S. emersum, Unbranched Bur-reed. In Coley Brook at SJ78021992; flowering this summer.

[*S. natans*, Least Bur-reed. Recorded by Garner in 1844.]

Typhaceae

Typha latifolia, Bulrush. Frequent in swamps and ditches.

T. angustifolia, Lesser Bulrush. Abundant around the mere, forming the first zone of emergent vegetation.

Liliaceae

Hyacinthoides non-scripta, Bluebell. Frequent in dry woods.

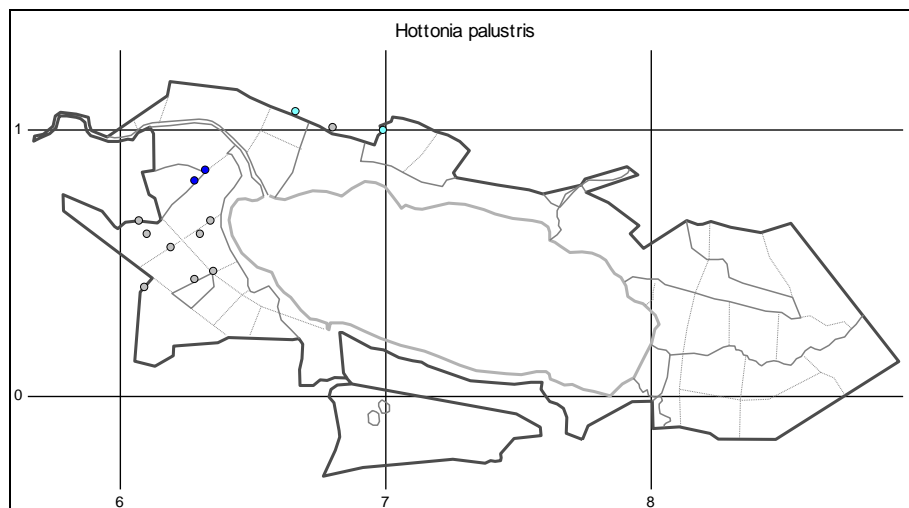
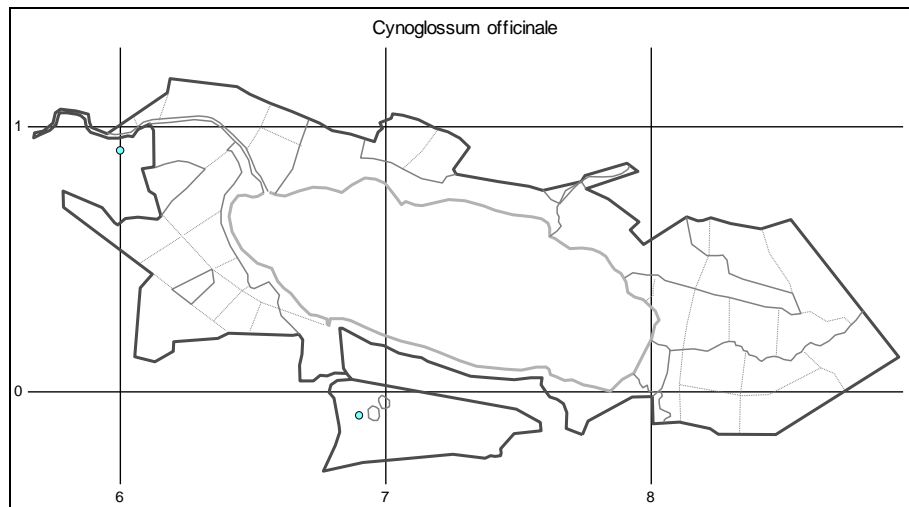
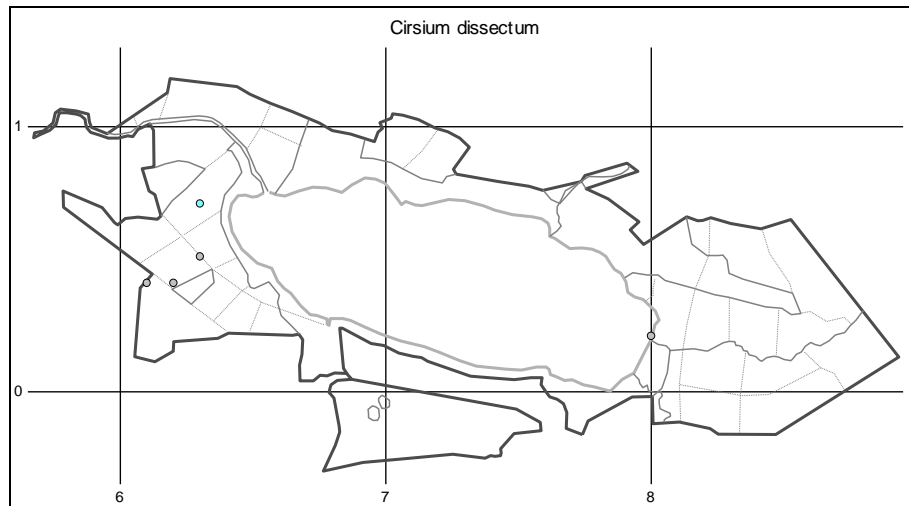
Iridaceae

Iris pseudacorus, Yellow Iris. Frequent in swamps and by the mere.

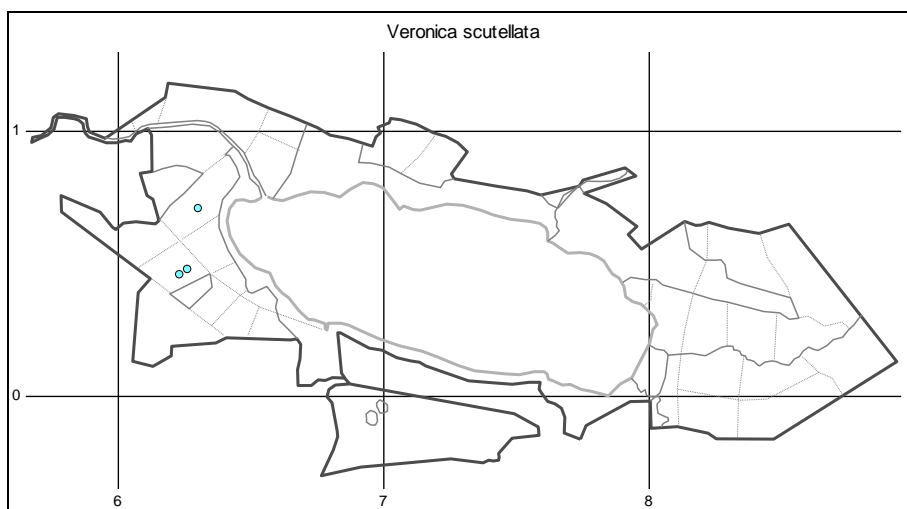
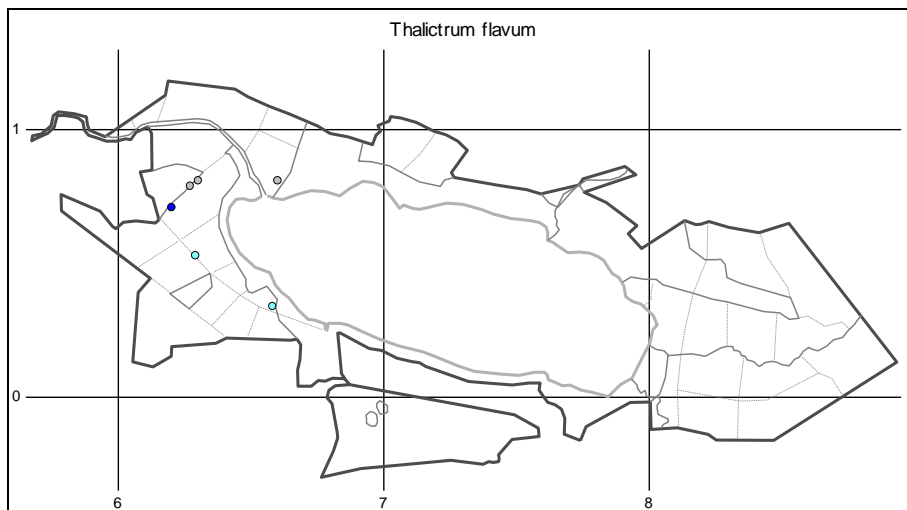
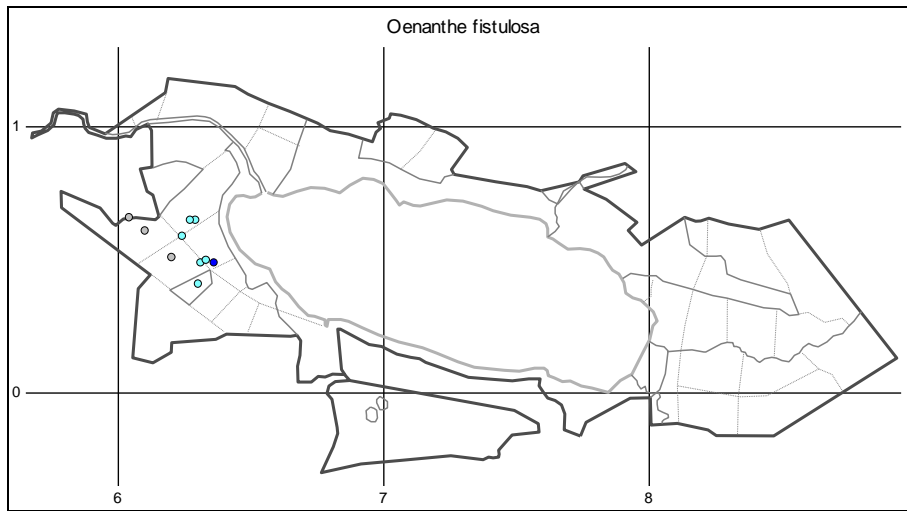
Orchidaceae

[*Dactylorhiza praetermissa*, Southern Marsh-orchid. Recorded as 'most plentiful' by Eedes in 1953, and also seen by Stevenson in 1985 and by Hopkins & Hawksford in 2002. The latter saw 'a mere half dozen' at SJ77472008.]

Distribution maps of selected species



Dark blue = 2005; light blue = 1995-2004; grey = prior to 1994.



Dark blue = 2005; light blue = 1995-2004; grey = prior to 1994.

Vegetation surveys

Martin Wigginton and colleagues surveyed the vegetation at Aqualate Mere on the 3rd and 4th of September 1979. This was part of an ecological study of the meres of the north-west Midlands, and their phytosociological data (Wigginton 1980) formed the basis of the descriptions of several communities in the National Vegetation Classification (Rodwell 1991-2000). Wigginton's team recorded ten quadrats around the mere, focusing on the fringing vegetation. The quadrats are reproduced here in full (with the original numbering), and reanalysed using Match.

Quadrats by Wigginton *et al.*, 1979

Quadrat No.	72	73	74	75	76	77	126	127	148	166
<i>Chiloscyphus</i> sp.	-	-	-	-	-	-	-	-	-	2
<i>Lophocolea bidentata</i>	-	-	-	-	-	-	-	-	-	1
<i>Mnium hornum</i>	-	-	-	-	-	-	-	-	-	2
<i>Plagiomnium undulatum</i>	-	-	-	-	-	-	-	-	-	1
<i>Leptodictyum riparium</i>	-	-	-	-	-	-	-	-	1	-
<i>Calliergonella cuspidata</i>	-	-	-	-	-	-	-	-	1	-
<i>Brachythecium rutabulum</i>	-	-	-	-	-	-	-	-	-	5
<i>B. rivulare</i>	-	-	-	-	1	-	3	-	2	2
<i>Eurhynchium praelongum</i>	-	-	-	-	1	-	2	-	1	5
<i>E. speciosum</i>	-	-	-	-	-	-	-	-	-	1
<i>Plagiothecium denticulatum</i>	-	-	-	-	-	-	-	-	-	1
<i>Dryopteris dilatata</i>	-	-	-	-	-	-	-	-	-	2
<i>Caltha palustris</i>	-	-	-	-	1	-	-	-	-	-
<i>Ranunculus repens</i>	-	-	-	-	2	-	1	-	-	-
<i>R. sceleratus</i>	-	-	-	5	-	-	-	-	1	-
<i>R. flammula</i>	-	-	-	-	1	-	-	-	1	-
<i>R. hederaceus</i>	-	-	-	2	-	-	-	-	-	-
<i>R. aquatilis sens. lat.</i>	-	-	-	1	-	-	-	-	-	-
<i>Ulmus glabra</i>	-	-	-	-	-	-	-	-	-	1
<i>Urtica dioica</i>	-	-	3	4	-	-	3	3	4	6
<i>Alnus glutinosa</i>	-	-	-	-	-	-	7	7	5	9
<i>Stellaria uliginosa</i>	-	-	-	-	1	-	-	-	-	-
<i>Lychnis flos-cuculi</i>	-	-	-	-	-	3	-	-	-	-
<i>Persicaria maculosa</i>	-	-	-	1	-	3	-	-	1	-
<i>P. hydropiper</i>	-	-	-	6	1	1	-	-	-	-
<i>Rumex acetosa</i>	-	-	-	1	-	-	-	-	-	-
<i>R. conglomeratus</i>	-	-	-	-	3	-	-	-	-	-
<i>R. sanguineus</i>	-	-	-	-	-	2	-	-	-	-
<i>R. maritimus</i>	-	-	-	6	-	-	-	-	-	-
<i>Salix fragilis</i>	-	-	8	-	-	-	3	6	-	-
<i>S. viminalis</i>	-	-	-	-	-	-	1	-	-	-
<i>S. caprea</i>	-	-	-	-	-	-	-	-	5	-
<i>S. cinerea ssp. oleifolia</i>	-	-	1	2	-	-	8	-	-	-
<i>S. aurita</i>	-	-	-	-	-	-	1	-	-	-
<i>Rorippa sylvestris</i>	-	-	-	3	-	-	-	-	-	-
<i>Cardamine pratensis</i>	-	-	-	-	2	-	-	-	1	-
<i>C. flexuosa</i>	-	-	-	2	-	-	3	-	-	-
<i>Lysimachia nemorum</i>	-	-	-	-	3	-	-	-	-	-
<i>L. vulgaris</i>	-	-	-	-	-	-	-	-	1	-
<i>Chrysosplenium oppositifolium</i>	-	-	-	-	-	-	1	-	-	-
<i>Filipendula ulmaria</i>	-	-	1	-	1	1	1	-	-	1
<i>Rubus fruticosus</i> agg.	-	-	-	-	-	-	-	-	-	2
<i>Potentilla anserina</i>	-	-	-	1	1	4	-	-	-	-
<i>Geum rivale</i>	-	-	-	-	-	-	-	-	-	1

<i>G. urbanum</i>	-	-	-	-	-	-	-	-	-	3
<i>Crataegus monogyna</i>	-	-	-	-	-	-	1	-	-	-
<i>Lotus pedunculatus</i>	-	-	-	-	4	-	-	-	-	-
<i>Trifolium repens</i>	-	-	-	-	1	-	-	-	-	-
<i>Lythrum salicaria</i>	1	-	-	-	-	3	-	-	2	-
<i>L. portula</i>	-	-	-	1	-	-	-	-	-	-
<i>Epilobium</i> sp.	-	-	-	2	1	-	-	-	-	-
<i>E. parviflorum</i>	-	-	-	3	-	-	-	-	-	-
<i>E. palustre</i>	-	-	-	-	1	-	-	-	-	-
<i>Acer pseudoplatanus</i>	-	-	-	-	-	-	-	6	-	7
<i>Hydrocotyle vulgaris</i>	-	-	-	-	1	-	-	-	-	-
<i>Angelica sylvestris</i>	-	-	-	-	1	-	-	-	-	-
<i>Solanum dulcamara</i>	3	-	3	-	-	-	4	4	3	2
<i>Myosotis scorpioides</i>	-	-	-	-	-	2	6	-	-	-
<i>M. secunda</i>	-	-	-	-	4	-	-	-	-	-
<i>M. laxa</i>	-	-	-	3	-	-	-	-	-	-
<i>Scutellaria galericulata</i>	-	-	1	-	-	-	-	-	-	2
<i>Ajuga reptans</i>	-	-	-	-	1	-	-	-	-	-
<i>Lycopus europaeus</i>	1	-	1	2	1	-	1	-	2	-
<i>Mentha</i> × <i>verticillata</i>	-	-	-	-	-	2	-	-	-	-
<i>M. aquatica</i>	1	-	1	2	6	5	1	-	1	-
<i>Callitriche stagnalis</i>	-	-	-	3	-	-	5	-	-	-
<i>Plantago major</i>	-	-	-	1	1	1	-	-	-	-
<i>Veronica serpyllifolia</i>	-	-	-	-	1	-	-	-	-	-
<i>V. beccabunga</i>	-	-	-	3	2	2	-	-	-	-
<i>V. catenata</i>	-	-	-	4	-	-	-	-	-	-
<i>Galium palustre</i>	4	-	1	-	4	-	-	-	2	6
<i>Sambucus nigra</i>	-	-	-	-	-	-	1	-	-	4
<i>Viburnum opulus</i>	-	-	-	-	-	-	-	-	-	1
<i>Cirsium arvense</i>	-	-	-	1	-	-	-	-	-	-
<i>Taraxacum officinale</i> agg.	-	-	-	1	-	-	-	-	-	-
<i>Senecio jacobaea</i>	-	-	-	-	-	3	-	-	-	-
<i>S. aquaticus</i>	-	-	-	2	1	-	-	-	-	-
<i>Bidens cernua</i>	-	-	-	-	-	5	-	-	-	-
<i>B. tripartita</i>	-	-	-	1	-	-	-	-	-	-
<i>Lemna minor</i>	-	-	-	-	-	-	-	-	3	-
<i>Juncus bufonius</i>	-	-	-	2	-	-	-	-	-	-
<i>J. acutiflorus</i>	-	-	-	-	4	-	-	-	-	-
<i>J. inflexus</i>	-	-	-	-	5	-	-	-	-	-
<i>J. effusus</i>	-	-	-	-	3	-	-	-	-	-
<i>Carex</i> sp.	-	-	-	-	-	4	-	-	-	-
<i>C. paniculata</i>	-	-	-	-	-	-	-	-	1	-
<i>C. remota</i>	-	-	-	-	-	-	-	-	2	-
<i>C. riparia</i>	-	-	-	-	2	-	-	7	-	4
<i>Festuca rubra</i>	-	-	-	-	3	-	-	-	-	-
<i>Poa pratensis</i>	-	-	-	1	4	-	-	-	-	-
<i>Glyceria maxima</i>	-	-	3	-	-	-	-	-	-	-
<i>Holcus lanatus</i>	-	-	-	-	1	-	-	-	-	-
<i>Phalaris arundinacea</i>	-	-	9	-	-	-	-	-	1	-
<i>Agrostis stolonifera</i>	-	-	-	1	-	5	-	-	-	-
<i>Calamagrostis canescens</i>	3	-	-	-	-	-	-	-	-	4
<i>Phragmites australis</i>	8	9	-	-	-	-	-	4	1	-
<i>Sparganium erectum</i>	2	-	-	-	-	3	-	-	-	-
<i>Typha angustifolia</i>	4	5	-	-	-	-	-	-	-	-
<i>Iris pseudacorus</i>	-	-	-	-	-	5	-	-	1	1

Analysis of Wigginton's quadrats

Q72. A 4m x 4m stand of reedswamp; grid reference given as SJ7720, but this is probably a site centroid. Wigginton assigned this to his VIII (ii) *Phragmites australis* community, which is equivalent to S4b *Phragmites australis* swamp *Galium palustre* subcommunity, with a fit of 50% using Match. The quadrat could have been recorded in many places around the mere.

Q73. A second stand of reedswamp, this time very species-poor, with just *Phragmites* and *Typha angustifolia* present. This is Wigginton's VIII (i) community, equivalent to S4a *Phragmites australis* swamp *Phragmites australis* subcommunity. Again, this could have been found in many places around the mere, possibly in deeper water than the previous example.

Q74. This is the most species-rich stand of reedswamp sampled by Wigginton. He considered this to be similar to the vegetation in Q73, but Match classifies it as S26 *Phragmites australis-Urtica dioica* fen. Wigginton is probably right – this is not a eutrophic fen community, but a stand of reedswamp succeeding to willow carr: possibly a mosaic of S4b and W2 *Salix cinerea-Betula pubescens-Phragmites australis* woodland. The confusion may be partly caused by the identification of the nettle as *Urtica dioica*, which has a high nitrogen requirement. If it is in fact *U. galeopsifolia*, then there are no indicators of eutrophication present.

Q75. A sample from 'closely grazed damp pasture' on the east shore of the mere, possibly ca. SJ780202. It is described as having much *Rumex maritimus*, *Persicaria hydropiper* and *Chenopodium rubrum*. Wigginton assigned it to his XI Littoral vegetation community, which encompasses several NVC types. Match fits it to the OV32 *Myosotis scorpioides-Ranunculus sceleratus* with a probability of 26%. This is quite a eutrophic vegetation type, which possibly reflects the localised influence of intensive grazing in this area at that time.

Q76. In the same area of pasture as Q75, but not on the shore of the mere, also probably about SJ780202. Wigginton put this in his XII damp pasture community, which has no real equivalent in the NVC. Match suggests M23 *Juncus effusus-Galium palustre* rush-pasture (39%). It seems a bit species-rich for M23 and there is not enough *Juncus*. Possibly this is an instance of a semi-improved damp pasture type such as MG10 *Holcus lanatus* grassland succeeding to M27 *Filipendula ulmaria-Angelica sylvestris* mire. Match gives this a fit of 31%.

Q77. This is another example of Wigginton's XI littoral vegetation, possibly recorded along the south shore. Like Q75 it seems closest to OV32 *Myosotis scorpioides-Ranunculus sceleratus* vegetation (26%).

Quadrats 126, 127, 148 and 166 were all recorded in the alder woodland to the west of the mere, in Mere Eye Covert (SJ7620). These are probably all best considered W5 *Alnus glutinosa-Carex paniculata* woodland, although it could be argued that only 148 really fits this description, while the others are closer to W6 *Alnus glutinosa-Urtica dioica* woodland (as Wigginton did, classifying these as XXi rather than XXiii). This returns to the question of the identification of the nettle, as the other species present do not suggest such a eutrophic community.

Stevenson & Nixon's survey

In 1985 K.R. Stevenson and M. Nixon recorded eight quadrats in three fields at Aqualate on a survey for the Nature Conservancy Council. They attempted to classify the vegetation according to the NVC (presumably using early drafts of the NVC books) and made general descriptions of the vegetation. Four of their quadrats were in fields at the very east end of the site; two were by the east shore of the mere; and two were in fields to the west. Perhaps the most interesting of these were Field 53, on the east shore, and Field 9 & 10, to the west.

Field 53 was described as marshy grassland with a small amount of *Cirsium dissectum* and a lot of *Juncus effusus*. There was a nettle bed along the edge of the water, and they considered that there were signs of agricultural improvement, with *Lolium perenne* and *Trifolium repens* being present. The compartment in question is now apparently lost within the vast area of *Phragmites* swamp and willow carr in this part of the site.

Fields 9 & 10 also show evidence of change. They are described as marshy grassland dominated by *Agrostis canina*, *Carex nigra* and *Hydrocotyle vulgaris*, with *Cirsium dissectum* abundant throughout. *Hottonia palustris* was present in the adjacent ditches in two places.

➤ Approximate positions of Stevenson & Nixon's quadrats in 1985



Stevenson and Nixon's quadrat data is a little sparse. Some species were clearly misidentified, the Domin scores often seem to be underestimates, and the total species diversity appears to be bit low. However, the NVC is robust technique, and analysis of the data is still possible. The full details are given below.

Stevenson considered quadrats 1-4 (relabelled here from the original letter codes) to be representative of MG9 *Holcus lanatus-Deschampsia cespitosa* grassland, which is not unreasonable. Quadrats 5 & 6 were MG10 *Holcus lanatus-Juncus effusus* rush-pasture, which is again not unlikely. A reasonable conclusion is that these fields were semi-improved at the time, and the vegetation was indeed MG9 and MG10, possibly with other agricultural communities such as M23 *Juncus effusus* rush-pasture (particularly as *J. effusus* was described as dominant, but only featured as a minor constituent of the quadrats).

No effort was made by Stevenson to identify the vegetation in the last two quadrats, to the west of the mere. Reanalysis using Match shows why: they do not fit any particular community very closely. Given the abundance of *Cirsium dissectum*, M24 or M22 would appear to be the most likely vegetation types, but neither features very highly in the analysis. M22 is the seventh in the list, with a fit of just 35%. It is probably best not to attempt to classify these samples, but to use them for comparison with later quadrats recorded in this area.

Quadrats by Stevenson & Nixon, 1985

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
<i>Equisetum palustre</i>	1	1	-	-	-	-	-	-
<i>Ranunculus acris</i>	3	-	-	-	-	-	3	3
<i>R. repens</i>	4	3	7	4	-	4	-	2
<i>R. sceleratus</i>	-	-	-	-	2	-	-	-
<i>R. flammula</i>	-	-	-	-	-	3	3	2
<i>Stellaria graminea</i>	-	-	-	-	-	-	3	2
<i>Cerastium fontanum</i>	-	-	-	-	2	-	2	-
<i>Lychnis flos-cuculi</i>	-	-	-	-	-	-	-	2
<i>Persicaria maculosa</i>	-	-	-	-	5	3	-	-
<i>P. hydropiper</i>	-	-	-	-	3	-	-	-
<i>Rumex acetosa</i>	-	3	-	1	-	2	-	-
<i>Lysimachia nummularia</i>	-	-	-	-	-	-	2	-
<i>Filipendula ulmaria</i>	-	-	-	-	-	-	2	2
<i>Potentilla anserina</i>	3	3	-	-	6	-	-	-
<i>Trifolium repens</i>	-	3	2	-	2	4	2	3
<i>Hydrocotyle vulgaris</i>	-	-	-	-	-	-	7	6
<i>Myosotis scorpioides</i>	-	-	-	-	3	-	-	-
<i>Prunella vulgaris</i>	-	-	-	-	-	-	2	-
<i>Mentha aquatica</i>	-	-	-	-	5	4	-	-
<i>Plantago lanceolata</i>	-	-	-	-	-	3	-	-
<i>Veronica beccabunga</i>	-	-	-	-	1	-	-	-
<i>Galium palustre</i>	-	-	-	-	-	3	2	2
<i>Cirsium dissectum</i>	-	-	-	-	1	-	3	7
<i>Centaurea nigra</i>	5	-	-	-	-	4	3	2
<i>Taraxacum officinale</i> agg.	-	-	-	-	-	-	2	-
<i>Senecio jacobaea</i>	2	-	-	-	-	3	-	-
<i>Juncus articulatus</i>	-	-	-	-	-	-	3	-
<i>J. effusus</i>	4	1	-	-	5	4	-	-
<i>Luzula campestris</i>	1	1	-	-	-	-	-	-
<i>Carex</i> sp.	-	-	-	-	-	3	-	-
<i>C. disticha</i>	-	-	-	-	-	-	2	-
<i>C. hirta</i>	1	3	5	3	-	-	-	-
<i>C. panicea</i>	-	-	-	-	-	-	7	7
<i>C. nigra</i>	-	-	-	7	-	-	3	-
<i>Festuca pratensis</i>	1	-	-	-	-	-	-	-
<i>F. rubra</i>	6	5	-	-	-	-	4	4
<i>Lolium perenne</i>	-	-	-	-	-	5	-	-
<i>Cynosurus cristatus</i>	-	-	-	-	-	-	-	3
<i>Poa trivialis</i>	-	-	4	5	4	6	-	-
<i>P. pratensis</i>	-	-	2	3	6	-	-	3
<i>Dactylis glomerata</i>	5	-	-	-	-	-	-	-
<i>Deschampsia cespitosa</i>	-	6	-	-	-	4	-	-
<i>Holcus lanatus</i>	3	6	8	7	-	3	5	4
<i>Anthoxanthum odoratum</i>	6	-	-	1	-	-	5	4
<i>Agrostis stolonifera</i>	-	3	-	3	4	-	-	-
<i>A. canina</i>	-	-	-	-	-	-	6	7
<i>Alopecurus geniculatus</i>	-	-	-	-	1	-	-	-

Details of quadrats

Q1. (Originally quadrat A) Field 59, SJ786201, K. Stevenson & M. Nixon, 25th June 1985. (*Cerastium arvense* 3 is considered unconfirmed).

- Q2. (B) Field 59, SJ785201, K. Stevenson & M. Nixon, 25th June 1985. (*Cerastium arvense* 1 is considered unconfirmed).
- Q3. (C) Field 61, SJ785199 (originally given as SJ199785), K.R. Stevenson & M. Nixon, 25th June 1985.
- Q4. (D) Field 61, SJ786200 (originally given as SJ200786), K.R. Stevenson & M. Nixon, 25th June 1985.
- Q5. (E) Field 53, no grid reference given (ca. SJ780202), K.R. Stevenson & M. Nixon, 28th June 1985.
- Q6. (F) Field 53, no grid reference given (ca. SJ780202), K.R. Stevenson, 28th June 1985.
- Q7. (G) Field 10, no grid reference given (ca. SJ763205), K.R. Stevenson, 1st July 1985.
- Q8. (H) Field 9, no grid reference given (ca. SJ761204), K.R. Stevenson, 1st July 1985.

The current survey

Some 22 quadrats were recorded in a variety of vegetation communities. Each was numbered to fit in with a running total of vegetation relevés recorded in the Meres & Mosses series. All were recorded following standard NVC procedures (Rodwell 1991-2000) with an 8-figure (10m) grid reference given using GPS (usually $\pm 6m$).

Quadrats 501-511

A.J. Lockton, 10th–25th August 2005

	501	502	503	504	505	506	507	508	509	510	511
<i>Riccia fluitans</i>	-	-	-	-	-	-	-	3	-	-	-
<i>Sphagnum squarrosum</i>	-	-	-	-	-	-	-	-	5	-	-
[<i>Warnstorfia fluitans</i>]	-	5	6	-	-	-	-	-	-	-	-
<i>Calliergon cordifolium</i>	-	-	-	-	-	-	-	-	2	-	-
<i>Equisetum arvense</i>	-	-	-	-	2	-	-	-	-	-	-
<i>E. palustre</i>	-	-	-	2	-	-	-	-	-	-	-
<i>Athyrium filix-femina</i>	1	1	-	-	-	-	-	-	-	-	-
<i>Caltha palustris</i>	-	-	-	1	-	-	-	-	-	-	-
<i>Ranunculus repens</i>	-	-	-	-	-	-	-	-	-	-	1
<i>R. flammula</i>	-	-	-	1	-	-	-	-	-	-	-
<i>Ulmus glabra</i>	-	-	-	-	-	-	-	-	-	4	-
<i>Urtica dioica</i>	-	-	-	1	-	-	-	-	-	-	-
<i>U. galeopsifolia</i>	-	5	-	-	-	-	5	-	-	3	-
<i>Quercus robur</i>	-	-	-	-	-	-	1	-	-	1	-
<i>Alnus glutinosa</i>	-	-	-	1	-	-	-	2	-	8	-
<i>Lychnis flos-cuculi</i>	-	-	-	-	-	-	-	-	-	-	2
<i>Persicaria amphibia</i>	-	-	-	2	-	-	-	-	-	-	-
<i>P. hydropiper</i>	-	-	-	3	-	-	-	-	-	-	-
<i>Rumex acetosa</i>	-	-	-	1	-	-	-	-	-	-	-
<i>R. crispus</i>	-	-	-	1	-	-	-	-	-	-	-
<i>R. obtusifolius</i>	-	-	-	1	-	-	-	-	-	-	-
<i>Hypericum elodes</i>	-	-	-	-	-	-	-	5	3	-	-
<i>Salix fragilis</i>	-	4	-	-	-	-	-	-	-	7	-
<i>S. cinerea</i>	-	8	-	2	-	-	6	-	-	-	-
<i>Lysimachia vulgaris</i>	-	2	-	-	-	-	-	-	-	-	-
<i>Chrysosplenium oppositifolium</i>	-	-	-	-	-	-	-	-	-	4	-
<i>Filipendula ulmaria</i>	-	6	-	4	10	8	-	-	-	4	5
<i>Rosa arvensis</i>	-	-	-	-	-	-	-	-	-	1	-
<i>Prunus spinosa</i>	-	-	-	-	-	-	-	-	-	1	-
<i>Crataegus monogyna</i>	-	-	-	-	-	-	1	-	-	1	-
<i>Lotus pedunculatus</i>	-	-	-	3	3	-	-	-	-	-	-
<i>Vicia cracca</i>	-	-	-	-	-	3	-	-	-	-	-
<i>Lathyrus pratensis</i>	-	-	-	-	3	-	-	-	-	-	1
<i>Lythrum salicaria</i>	-	4	-	-	-	-	-	-	-	2	-
<i>Epilobium hirsutum</i>	-	-	-	1	-	-	1	-	-	-	-
<i>E. parviflorum</i>	-	3	2	-	-	-	-	-	-	-	-
<i>E. obscurum</i>	-	-	-	-	3	-	-	-	-	-	-
<i>E. ciliatum</i>	-	-	-	2	-	-	-	-	-	-	-
<i>E. palustre</i>	-	-	3	-	-	-	-	-	-	-	-
<i>Acer pseudoplatanus</i>	-	-	-	-	-	-	-	-	-	4	-
<i>Geranium robertianum</i>	-	-	-	-	-	-	-	-	-	1	-
<i>Impatiens capensis</i>	-	3	4	-	-	-	-	-	-	-	-
<i>Hydrocotyle vulgaris</i>	-	-	-	-	-	-	-	4	5	-	4
<i>Berula erecta</i>	-	-	6	-	-	-	-	-	-	-	-

<i>Solanum dulcamara</i>	3	-	-	-	-	-	2	-	-	4	-
<i>Calystegia sepium</i> ssp. <i>sepium</i>	-	-	-	1	-	-	-	-	-	-	-
<i>Myosotis scorpioides</i>	-	-	2	-	-	-	-	-	-	-	-
<i>M. laxa</i>	-	-	-	-	-	-	-	2	1	-	-
<i>Scutellaria galericulata</i>	-	-	-	-	-	4	-	3	2	2	-
<i>Lycopus europaeus</i>	-	3	-	5	-	1	-	4	2	2	-
<i>Mentha aquatica</i>	-	3	5	6	-	-	-	-	-	-	3
<i>Callitriche stagnalis</i>	-	-	-	-	-	-	-	3	-	-	-
<i>Fraxinus excelsior</i>	1	-	-	-	-	-	-	-	-	6	-
<i>Scrophularia nodosa</i>	-	-	-	-	-	-	-	-	-	-	-
<i>S. auriculata</i>	-	-	-	2	-	-	-	-	-	-	-
<i>Galium palustre</i>	-	4	5	4	-	1	-	2	3	-	3
<i>G. aparine</i>	-	-	-	-	-	-	1	-	-	-	-
<i>Viburnum opulus</i>	-	-	-	-	-	-	-	-	-	1	-
<i>Valeriana officinalis</i>	-	-	-	1	-	5	-	-	-	1	-
<i>Cirsium palustre</i>	-	-	-	-	4	-	-	-	-	-	-
<i>Senecio aquaticus</i>	-	-	-	2	-	-	-	-	-	-	3
<i>Bidens cernua</i>	-	-	3	-	-	-	-	3	-	-	-
<i>Lemna minor</i>	-	-	-	-	-	-	-	3	-	-	-
<i>Juncus subnodulosus</i>	-	-	-	4	4	5	-	-	-	-	-
<i>J. articulatus</i>	-	-	-	1	-	-	-	-	-	-	4
<i>J. inflexus</i>	-	-	-	1	2	-	-	-	-	-	-
<i>J. effusus</i>	-	-	-	4	4	-	-	8	10	-	5
<i>J. conglomeratus</i>	-	-	-	-	-	-	-	-	-	-	4
<i>Eleocharis palustris</i>	-	-	-	4	-	-	-	3	-	-	-
<i>Carex paniculata</i>	-	-	-	-	-	-	-	4	-	-	-
<i>C. disticha</i>	-	-	-	4	3	-	-	-	-	-	-
<i>C. hirta</i>	-	-	-	-	3	-	-	-	-	-	-
<i>C. acutiformis</i>	10	-	-	6	-	2	-	-	-	10	-
<i>C. riparia</i>	-	2	-	-	-	-	-	-	-	-	-
<i>C. pseudocyperus</i>	-	1	4	-	-	-	-	-	-	-	-
<i>C. rostrata</i>	-	-	-	-	-	-	-	5	-	-	-
<i>Glyceria maxima</i>	-	-	-	4	-	10	-	-	-	-	-
<i>Deschampsia cespitosa</i>	-	-	-	3	-	-	-	-	-	-	7
<i>Holcus lanatus</i>	-	-	-	-	3	-	-	-	-	-	-
<i>Phalaris arundinacea</i>	-	-	-	5	-	3	5	-	-	-	-
<i>Agrostis stolonifera</i>	-	-	-	3	-	-	-	-	-	-	5
<i>A. canina</i>	-	-	-	-	-	-	-	4	4	-	-
<i>Calamagrostis canescens</i>	-	6	-	-	-	-	8	-	-	3	-
<i>Phleum pratense</i>	-	-	-	-	-	-	-	-	-	-	1
<i>Molinia caerulea</i>	-	-	-	-	-	-	-	-	-	-	8
<i>Phragmites australis</i>	3	8	10	-	-	-	4	-	-	-	-
<i>Typha latifolia</i>	-	4	-	-	-	-	-	1	-	-	-
<i>T. angustifolia</i>	-	-	6	-	-	-	-	-	-	-	-
<i>Iris pseudacorus</i>	-	-	-	5	-	2	-	-	-	-	2

Quadrats 512-522

A.J. Lockton, 11th September 2005

	512	513	514	515	516	517	518	519	520	521	522
<i>Plagiomnium undulatum</i>	-	-	-	-	-	3	-	-	-	-	-
<i>Calliergonella cuspidata</i>	-	-	-	-	3	-	-	-	-	-	-
<i>Brachythecium rutabulum</i>	-	-	-	-	-	-	1	-	-	-	-
<i>Eurhynchium praelongum</i>	-	-	-	-	1	1	-	-	-	-	-
<i>Equisetum palustre</i>	-	-	-	-	-	-	-	-	-	2	-
<i>E. telmateia</i>	-	-	-	-	-	6	-	-	-	-	-
<i>Pteridium aquilinum</i>	-	-	-	-	-	7	-	-	-	-	-
<i>Dryopteris dilatata</i>	-	-	-	-	2	4	-	-	-	-	-
<i>Ranunculus repens</i>	-	-	-	1	-	-	4	-	-	-	-
<i>Urtica dioica</i>	4	-	1	-	-	1	5	5	-	-	-
<i>U. galeopsifolia</i>	-	-	-	-	3	-	3	-	-	-	2
<i>Betula pendula</i>	-	-	-	-	-	6	-	-	-	-	-
<i>Alnus glutinosa</i>	5	-	-	-	9	7	5	5	-	-	1
<i>Chenopodium rubrum</i>	1	-	-	-	-	-	-	-	-	-	-
<i>Stellaria graminea</i>	-	-	-	1	-	-	-	-	-	-	-
<i>S. uliginosa</i>	-	1	-	-	-	-	2	-	-	-	-
<i>Silene dioica</i>	-	-	-	-	-	1	-	-	-	-	-
<i>Persicaria amphibia</i>	-	3	-	-	-	-	-	-	-	-	-
<i>P. maculosa</i>	5	-	-	-	-	-	-	-	-	-	-
<i>P. hydropiper</i>	5	-	-	-	-	-	-	-	-	-	-
<i>Rumex acetosa</i>	-	-	1	-	-	-	-	-	2	-	1
<i>R. hydrolapathum</i>	-	-	1	-	-	-	-	-	-	4	4
<i>R. sanguineus</i>	-	-	-	-	-	-	2	2	-	-	-
<i>R. obtusifolius</i>	4	-	2	-	-	-	-	-	-	-	-
<i>Salix fragilis</i>	-	-	-	-	-	-	8	7	-	1	-
<i>S. purpurea</i>	-	-	-	-	-	-	-	-	-	1	-
<i>S. ^xsmithiana</i>	-	-	-	-	-	7	-	-	-	-	-
<i>S. cinerea</i>	-	-	-	-	6	5	5	7	-	-	1
<i>Hottonia palustris</i>	-	-	-	-	-	-	-	-	-	7	-
<i>Lysimachia vulgaris</i>	-	-	-	-	-	-	-	-	-	1	-
<i>Ribes rubrum</i>	-	-	-	-	-	-	4	-	-	-	-
<i>Chrysosplenium oppositifolium</i>	-	-	-	-	-	-	5	4	-	-	-
<i>Filipendula ulmaria</i>	-	4	-	-	5	-	2	-	3	-	5
<i>Rubus fruticosus</i> agg.	-	-	-	-	-	6	-	-	-	-	-
<i>Potentilla anserina</i>	-	4	-	2	-	-	-	-	-	-	-
<i>P. erecta</i>	-	-	-	1	-	-	-	-	2	-	-
<i>Geum urbanum</i>	-	-	-	-	-	-	-	2	-	-	-
<i>Rosa arvensis</i>	-	-	-	-	1	2	-	-	-	-	-
<i>Crataegus monogyna</i>	-	-	-	-	-	-	-	1	-	-	-
<i>Lotus pedunculatus</i>	-	-	2	2	-	-	-	-	4	-	3
<i>Epilobium hirsutum</i>	2	-	4	-	-	-	-	4	-	-	-
<i>E. parviflorum</i>	-	-	1	1	-	-	-	-	-	-	-
<i>Chamerion angustifolium</i>	-	-	-	-	-	4	-	-	-	-	-
<i>Circaea lutetiana</i>	-	-	-	-	-	-	3	-	-	-	-
<i>Acer pseudoplatanus</i>	-	-	-	-	-	4	-	-	-	-	-
<i>Oxalis acetosella</i>	-	-	-	-	-	1	-	-	-	-	-
<i>Geranium robertianum</i>	-	-	-	-	-	-	1	-	-	-	-
<i>Oenanthe crocata</i>	-	-	-	-	-	-	-	4	-	-	-
<i>Angelica sylvestris</i>	-	4	1	-	-	-	4	4	-	-	1
<i>Solanum dulcamara</i>	-	-	-	-	5	-	3	4	-	1	4
<i>Calystegia sepium</i>	2	-	-	-	-	-	-	-	-	-	-
<i>Myosotis scorpioides</i>	-	-	-	-	-	-	3	3	-	-	-

<i>Galeopsis tetrahit</i>	-	-	-	1	-	-	1	-	-	-	-
<i>Scutellaria galericulata</i>	-	4	-	-	-	-	-	-	-	-	-
<i>Glechoma hederacea</i>	-	-	-	-	-	-	2	1	-	-	-
<i>Lycopus europaeus</i>	4	-	1	-	-	-	4	4	-	-	1
<i>Mentha aquatica</i>	-	-	-	1	-	-	-	4	-	-	3
<i>Plantago lanceolata</i>	-	-	-	4	-	-	-	-	4	-	-
<i>Fraxinus excelsior</i>	-	-	-	-	5	-	-	-	-	-	-
<i>Scrophularia auriculata</i>	-	-	-	-	-	-	4	2	-	-	-
<i>Veronica montana</i>	-	-	-	-	-	-	-	4	-	-	-
<i>Galium palustre</i>	-	-	-	3	-	-	-	-	3	-	3
<i>G. aparine</i>	-	-	-	-	-	-	3	-	-	-	-
<i>Viburnum opulus</i>	-	-	-	-	2	-	-	-	-	-	-
<i>Succisa pratensis</i>	-	-	-	1	-	-	-	-	-	-	-
<i>Cirsium palustre</i>	-	-	1	5	-	-	-	-	4	-	-
<i>C. arvense</i>	2	-	-	-	-	-	-	-	-	-	-
<i>Senecio aquaticus</i>	-	-	-	-	-	-	-	2	1	-	-
<i>Bidens tripartita</i>	6	-	-	-	-	-	-	-	-	-	-
<i>Eupatorium cannabinum</i>	-	-	-	-	-	-	-	4	-	-	-
<i>Alisma plantago-aquatica</i>	-	-	-	-	-	-	-	-	-	2	-
<i>Triglochin palustre</i>	-	-	-	-	-	-	-	-	3	-	-
<i>Lemna minor</i>	5	-	-	-	-	-	-	-	-	-	-
<i>L. minuta</i>	-	-	-	-	-	-	-	-	-	5	-
<i>Juncus subnodulosus</i>	-	-	-	-	-	-	-	-	8	-	-
<i>J. articulatus</i>	-	-	-	-	-	-	-	-	3	-	-
<i>J. acutiflorus</i>	-	-	3	4	-	-	-	-	-	-	5
<i>J. inflexus</i>	-	3	-	-	-	-	-	-	-	-	-
<i>J. effusus</i>	-	8	3	7	-	-	-	-	-	-	3
<i>J. conglomeratus</i>	-	-	-	-	-	-	-	-	2	-	-
<i>Scirpus sylvaticus</i>	-	-	5	-	-	-	-	-	-	-	-
<i>Schoenoplectus tabernaemontani</i>	-	-	-	-	-	-	-	-	-	-	3
<i>Carex paniculata</i>	-	-	-	-	-	-	-	-	-	5	-
<i>C. disticha</i>	-	5	5	-	-	-	-	-	-	-	4
<i>C. remota</i>	-	-	-	-	-	-	1	1	-	-	-
<i>C. acutiformis</i>	-	-	8	-	5	6	-	5	-	-	8
<i>C. panicea</i>	-	-	-	-	-	-	-	-	8	-	-
<i>C. viridula ssp. oedocarpa</i>	-	-	-	4	-	-	-	-	3	-	-
<i>C. nigra</i>	-	-	-	6	-	-	-	-	-	-	-
<i>C. elata</i>	-	-	-	-	-	-	-	-	-	1	-
<i>Festuca gigantea</i>	-	-	-	-	-	-	4	4	-	-	-
<i>F. rubra</i>	-	-	-	5	-	-	-	-	-	-	-
<i>Cynosurus cristatus</i>	-	-	3	-	-	-	-	-	-	-	-
<i>Poa trivialis</i>	-	-	-	-	-	2	3	3	-	-	-
<i>Glyceria maxima</i>	-	-	-	-	-	-	-	-	-	5	4
<i>G. fluitans</i>	-	-	1	-	-	-	-	-	-	-	-
<i>Arrhenatherum elatius</i>	-	-	2	-	-	-	-	-	-	-	-
<i>Deschampsia cespitosa</i>	-	5	2	4	-	-	-	-	2	-	-
<i>Holcus lanatus</i>	-	-	3	-	-	-	-	-	5	-	-
<i>Anthoxanthum odoratum</i>	-	-	-	3	-	-	-	-	4	-	-
<i>Phalaris arundinacea</i>	-	2	-	-	-	2	4	3	-	4	-
<i>Agrostis stolonifera</i>	-	7	6	3	-	-	-	-	-	3	-
<i>A. canina</i>	-	-	-	4	-	-	-	-	5	-	-
<i>Calamagrostis canescens</i>	-	-	-	-	6	-	-	-	-	-	-
<i>Phleum pratense</i>	-	3	3	-	-	-	-	-	-	-	-
<i>Elymus caninus</i>	-	-	-	-	-	-	1	1	-	-	-
<i>Molinia caerulea</i>	-	-	3	-	-	-	-	-	3	-	-
<i>Phragmites australis</i>	1	-	-	-	8	-	-	-	-	-	-
<i>Sparganium erectum</i>	-	-	-	-	-	-	-	-	-	5	-

<i>Typha latifolia</i>	-	-	-	-	-	-	-	4	-	2	-
<i>T. angustifolia</i>	-	-	-	-	-	-	-	-	-	-	7
<i>Iris pseudacorus</i>	-	-	-	-	1	-	-	-	-	-	3

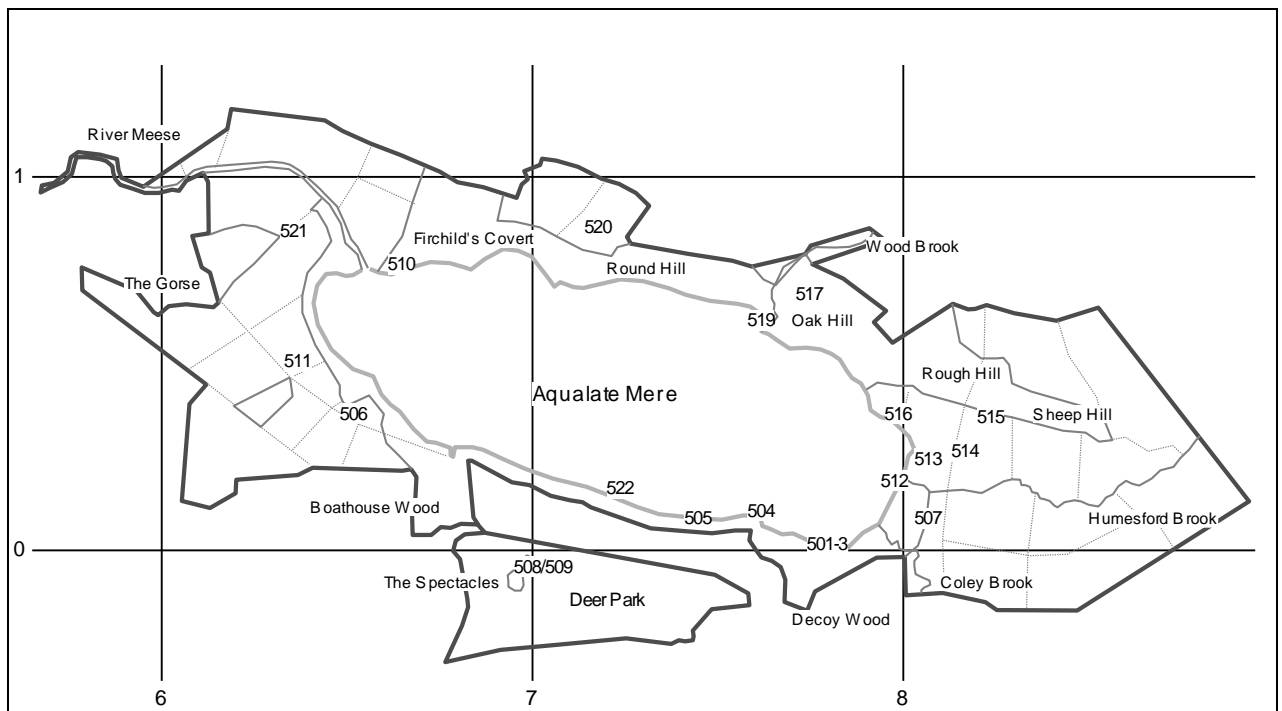
Analysis of quadrats

Q501. Sedge swamp in a ditch flowing through woodland close to the south-east shore, SJ77742000, AJL, 10th August 2005. This is a stand of S7 *Carex acutiformis* swamp, which is characteristic throughout this site in ditches and wet field margins where there has been little management. It can also persist in shade, as in this situation.

Q502. Reedswamp between the woodland and the mere, SJ77762002. This is a species-rich type of *Phragmites australis* swamp that is difficult to classify, possibly because fens outside the Norfolk Broads are poorly represented in the NVC. It may be best to describe it as a type of S24 *Phragmites australis*-*Peucedanum palustre* fen.

Q503. Floating reedswamp on the edge of the mere, SJ77762004. Here *Typha angustifolia* replaces *T. latifolia*, and trees are almost absent. Given the lower species diversity, it is closer to S4b *Phragmites australis* reedswamp *Galium palustre* subcommunity.

➤ Locations of the quadrats



Q504. Marginal vegetation along the south shore, SJ77582009. It is very species rich and heterogeneous, and appears similar to that recorded in Wigginton's quadrat 76. There is light grazing and evidence of tree clearance to maintain the open sward. Match shows some correlation with M27 *Filipendula ulmaria*-*Angelica sylvestris* mire and to M22 *Juncus subnodulosus*-*Cirsium palustre* mire. The latter seems most likely, with the patchy vegetation being dominated in places by *Carex disticha*, *Juncus subnodulosus* and *Carex acutiformis*.

Q505. Another stand of marginal vegetation along the south shore, SJ77412007. This stand is overwhelmingly dominated by *Filipendula ulmaria*, and analysis with Match shows that it is closest to M27c *Filipendula ulmaria*-*Angelica sylvestris* mire, *Juncus effusus*-*Holcus lanatus* subcommunity. The previous surveys by Wigginton and Stevenson show that when these margins were in agricultural production the sward was probably MG10 *Holcus lanatus*-*Juncus effusus* rush-pasture; M27 might be a natural succession from this with a relaxation of grazing pressure.

Q506. A swamp dominated by *Glyceria maxima* in a field some distance from the south-western shore of the mere, at SJ76482035. This cannot be anything but S5 *Glyceria maxima* swamp, but it is not a very typical example – Match only gives a 33% correlation, as opposed to 42% for S24. The reason for this is largely that it contains *Juncus subnodulosus*, which does not occur in S5. *Glyceria maxima* swamp is normally found on much wetter substrates, often floating on the margins of ponds. Here it has presumably invaded an unmanaged field of pasture, which suggests that it must be very wet in winter.

Q507. This quadrat was recorded in an extensive area of *Phragmites australis* swamp to the east of the mere, SJ78032007, where fields have been left unmanaged for at least a decade or so. There is a lot of willow scrub in the area, and it is slowly turning to woodland. The quadrat was in an open area where the dominant grass was *Calamagrostis canescens* and where there was frequent *Urtica galeopsifolia*. This is probably no more than variation within the much larger stand of S26 *Phragmites australis*-*Urtica dioica* fen (Match gives a 49% fit to the S26d *Epilobium hirsutum* subcommunity). Although this is a eutrophic community, the substitution of *U. galeopsifolia* for *U. dioica* suggests that it may be less enriched than expected.

Q508. Edge of the eastern pool at The Spectacles, SJ76981994, 25th August 2005. This pool is surrounded by *Juncus effusus* and *Carex paniculata* and has carpets of *Hypericum elodes* over a deep peat soil. It is undoubtedly the last fragment of a raised mire that has long since been drained and destroyed. Analysis of the data produces some interesting results. It is perhaps closest to S12 *Typha latifolia* swamp (33%), which is a common community of eutrophic standing water in the agricultural lowlands, but it can be characteristic of peaty sites like this where there is eutrophication. Match also offers S27 *Carex rostrata*-*Potentilla palustris* tall-herb fen as a possibility (32%) or, possibly, M29 *Hypericum elodes*-*Potamogeton polygonifolius* soakway (21%). One explanation is that it might well have once been a stand of M29 on the edge of a raised mire, but as the site was drained and the pool became more eutrophic it turned into S27 and is now beginning to develop S12. With cover of *Typha latifolia* still very low, it is probably best to consider it currently closest to S27.

- The Spectacles East Pool (see Q508).



Q509. A stand of *Juncus effusus* rush-pasture some distance from the pool above, at SJ76981996. Again there is some *Hypericum elodes* in the wetter areas. This also comes out to S27 *Carex rostrata*-*Potentilla palustris* tall-herb fen (31%), although neither of the named species are actually present in the sample. An alternative is M23 *Juncus effusus*-*Galium palustre* rush-pasture (26%), which is probably what the transition is towards, if eutrophication and high levels of grazing continue. Because this stand is so dominated by *J. effusus* (although that is not impossible for S27) it is probably best to consider this a very good example of M23 rather than a poor stand of S27.

Q510. Woodland close to the north-west shore, SJ76612075. This is a good stand of typical W5a *Alnus glutinosa*-*Carex paniculata* woodland, *Phragmites australis* subcommunity, which is the main woodland

type around the shore of the mere. In this example, *Carex acutiformis* replaces *Phragmites* in the understorey, which is not unusual in closed woodland of this type.

Q511. This quadrat was recorded in a meadow west of the mere at SJ76332049. On 25th August it was rather late in the season for grasslands, and the survey was not made easier by high levels of grazing and trampling by cattle. This is a part of the site where *Cirsium dissectum* was once frequent, but no plants were to be found. The grasslands west of the mere are somewhat varied: M23 *Juncus effusus* rush-pasture and MG9 *Deschampsia cespitosa* grassland are almost certainly present, and indicative of a certain level of agricultural improvement. There are also tall herb-rich fens of *Filipendula ulmaria* (M27), *Phragmites australis* (S26) and *Glyceria maxima* (S5) where the management has been very lax. Quadrat 511 is in one of the better stands of *Molinia caerulea* grassland, which would ideally be M24 *Molinia caerulea-Cirsium dissectum* grassland. In this instance it is not possible to demonstrate that community, and it seems closer to M23 or M27. This area warrants further investigation at a more appropriate time of year for grassland survey.

Q512. East shore of the mere, close to the bird hide, SJ77992022, 11th September 2005. This area is kept free from reeds only by regular management, and is hemmed in on both sides by reedswamp. It is a rather ruderal community, and eutrophic, with a variety of tall herbaceous species present in very mixed stands. Curiously, the management and careful placing of a quadrat does not seem to affect the analysis: Match records a 34% fit to S26 *Phragmites australis-Urtica dioica* fen, which is undoubtedly what it would be if the reeds were allowed to grow for a year or two. The alternative is OV30 *Bidens tripartita-Polygonum amphibium* community (21%), which is what it would probably be if the shoreline here were grazed rather than cut.

- The shoreline by the bird hide (see Q512).



Q513. An area of unmanaged tall herb vegetation near the east shore, 10m east of Q512, at SJ78032023. This is former grassland, described by Stevenson & Nixon in 1985 as semi-improved pasture. Now it is probably closest to M27 *Filipendula ulmaria-Angelica sylvestris* mire (30% fit using Match), which is typical of eutrophic unmanaged vegetation on rather peaty soils. Interestingly, it is also still close to MG10 *Holcus lanatus* grassland (29%) which suggests that Stevenson & Nixon were correct in their analysis.

Q514. Another unmanaged field of tall herb to the east of the mere, close to the footpath, at SJ78132025. The quadrat was placed here partly to record the associated species growing with *Scirpus sylvaticus*, which is an unusual species to find in the meres & mosses, and which curiously does not seem to have been recorded at Aqualate before this year. Such 'rare plant' quadrats are often difficult to classify because they are not in typical stands of vegetation, and that is certainly the case here. There are no likely communities to which it can be assigned – it is merely a tall herb community in transition from grassland to either sedge swamp, reedbed or woodland.

- Field north of the mere (see Q520).



Q515. This quadrat was in a grazed field east of the mere, at SJ78202034. It is one of about have a dozen such fields, occupying many hectares. The vegetation is heterogeneous and is difficult to survey accurately so late in the year. This quadrat is a rather fine example of M23 *Juncus effusus*-*Galium palustre* rush-pasture, but there are probably other communities also present in these fields.

Q516. A stand of woodland on the north-east shore, SJ77952035. This is good W5a *Alnus glutinosa*-*Carex paniculata* woodland, *Phragmites australis* subcommunity (note with a good quantity of *Phragmites australis* this time) – giving a 42% fit using Match.

Q517. Woodland at the base of Oaks Hill, SJ77712063. In this area there are flushes and damp hollows surrounded by drier ground, and species of both wet and dry soils occur intermixed. This makes it difficult to record the woodland, which appears to be a mixture of W6 *Alnus glutinosa*-*Urtica dioica* woodland and W10 *Quercus robur*-*Pteridium aquilinum*-*Rubus fruticosus* woodland. The latter occurs on the hills north of here, while the former is more clearly seen in the following quadrat.

Q518 & Q519. Woodland close to the north shore of the mere, SJ77602059 & SJ77582060. A stream runs down to the mere at this point, and the area exhibits some base-enrichment and eutrophication. This is good W6a *Alnus glutinosa*-*Urtica dioica* woodland, typical subcommunity. The difference between this and the W5 that is found along other parts of the north shore is that mineral soil is deposited by the stream, so it is not growing on such acidic peat as elsewhere.

Q520. Field to the north of the mere, SJ77142085. This is adjacent to Thistleyfield Covert and is roughly in the area where *Cirsium dissectum* was recorded long ago. It is adjacent to the field where Hopkins & Hawksford recorded other interesting species such as *Carex elata* and *C. acuta*. Unfortunately, the fields were grazed and trampled by cattle at the time of survey, so recording quadrats was difficult. The fields are badly drained, with a large expanse of bare mud along the southern side where water must have stood throughout much of the summer. Analysis suggests that it is either M23 *Juncus effusus* rush-pasture (42%) or M24 *Molinia caerulea*-*Cirsium dissectum* fen-meadow (41%). Given the lack of *Cirsium dissectum* and the small amount of *Molinia*, it is reasonable to conclude the former, but it would be

interesting to resurvey in early summer, and it is likely that good management could tip the balance in favour of the latter community.

Q521. A ditch to the west of the mere, at SJ76322084. This ditch, which is part of a network draining a vast expanse of peatland, is one that has retained some of the interesting species of the area, including *Hottonia palustris*. The reason for this is partly because it runs along the edge of a wood, and the shade prevents the excessive growth of reeds and sedges and maintains some bare substrate. However, it does seem to be only the shade-tolerant species that have persisted. It is not easy to assign this vegetation to a particular community, which is not unusual for ditches, which are not well covered in the NVC. Match offers a range of swamp communities, the most promising of which is S12 *Typha latifolia* swamp. Alternatively, it could arguably be a woodland ground flora – possibly akin to that of W4 *Betula pubescens* woodland, in which *Hottonia palustris* is often present in old ditches.

- A ditch to the west of the mere (see Q521).



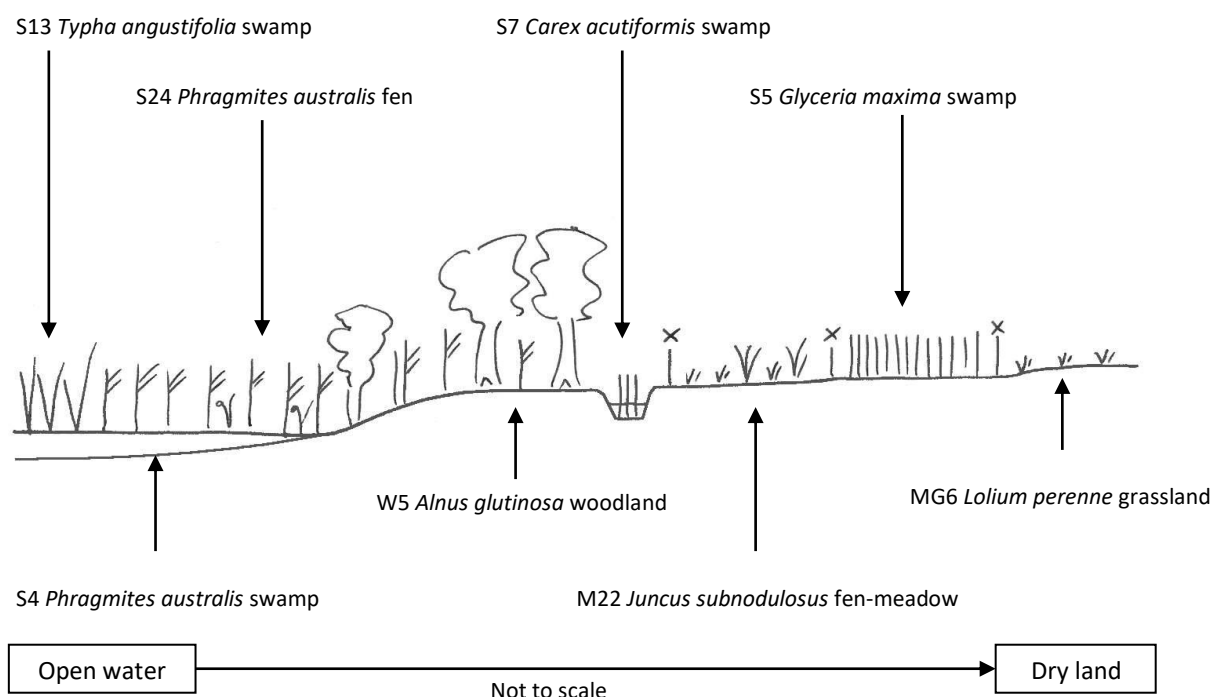
Q522. A stand of tall herb on the south shore of the mere, SJ77202015. This quadrat was placed to record the vegetation with *Schoenoplectus tabernaemontani*, and is inevitably difficult to classify. It has some resemblance to S24 *Phragmites australis*-*Peucedanum palustre* tall-herb fen but could alternatively just be a series of transitions from M27 *Filipendula ulmaria* to S7 *Carex acutiformis* and S13 *Typha angustifolia* swamps around the edge of the mere.

Summary of vegetation communities

The vegetation communities at Aqualate are numerous and complex. They are nearly all characteristic of a partially drained peatland, and the extent and quality of these communities is what makes the site important. There are no rare or ancient vegetation types.

The plan below illustrates a typical cross-section of the margin of the mere. The open water (at the left end) is probably best described as A8 *Nuphar lutea* vegetation, although *N. lutea* itself is only abundant at the north-west end of the mere. The open water mostly seems to contain sparse populations of *Zannichellia palustris* and *Potamogeton pectinatus* amongst large amounts of algae.

- Section across a typical part of the shoreline of the mere.



Around much of the margin of the mere there are stands of S13 *Typha angustifolia* swamp, often floating on the outer extreme of the reedswamp zone or rooted in deep water. The next belt of vegetation is species-poor S4 *Phragmites australis* swamp. Both S4a and S4b occur, and in the past there was some S20 *Schoenoplectus tabernaemontani* swamp, although this has just about gone now.

Where there is some base-enrichment from surface water, the landward edges of the *Phragmites* swamp are rather species-rich, and approach S24 *P. australis*-*Peucedanum palustre* fen. This is one of the rarest and most interesting vegetation types in the site, but there are few sizeable stands, as it forms a very narrow belt in shallow water around the shoreline. It quickly gives way to woodland: either W5 *Alnus glutinosa*-*Carex paniculata* woodland or, where there is some eutrophication, W6 *A. glutinosa*-*Urtica dioica* woodland. Where there is deep (but dry) peat, as on the south-east shore, there is W4 *Betula pubescens* woodland instead, succeeding to W10 *Quercus robur* woodland.

The ditches are difficult to describe. Their vegetation depends very much on the management. Probably the most common vegetation in the ditches is S7 *Carex acutiformis* swamp, but S26 *Phragmites australis*-*Urtica dioica* fen also occurs, and many of the ditches are now double-fenced and too shaded by trees to support any interesting aquatic flora. A number of other communities could probably be described from ditches in varying states of maintenance.

The grazed fields appear to be mostly M23 *Juncus effusus* rush-pasture, with the most species-rich areas approaching good M22 *Juncus subnodulosus* fen-meadow. The undergrazed areas tend towards M27

Filipendula ulmaria mire. We have found no good examples of M24 *Molinia caerulea*-*Cirsium dissectum* fen-meadow, but this is surely what some of the fields were in the past, and to restore these should be a management objective. Surveys really need to be conducted earlier in the year (June-July) if the grassland is to be monitored effectively. Some areas of MG10 *Holcus lanatus* grassland and MG9 *Deschampsia cespitosa* grassland persist.

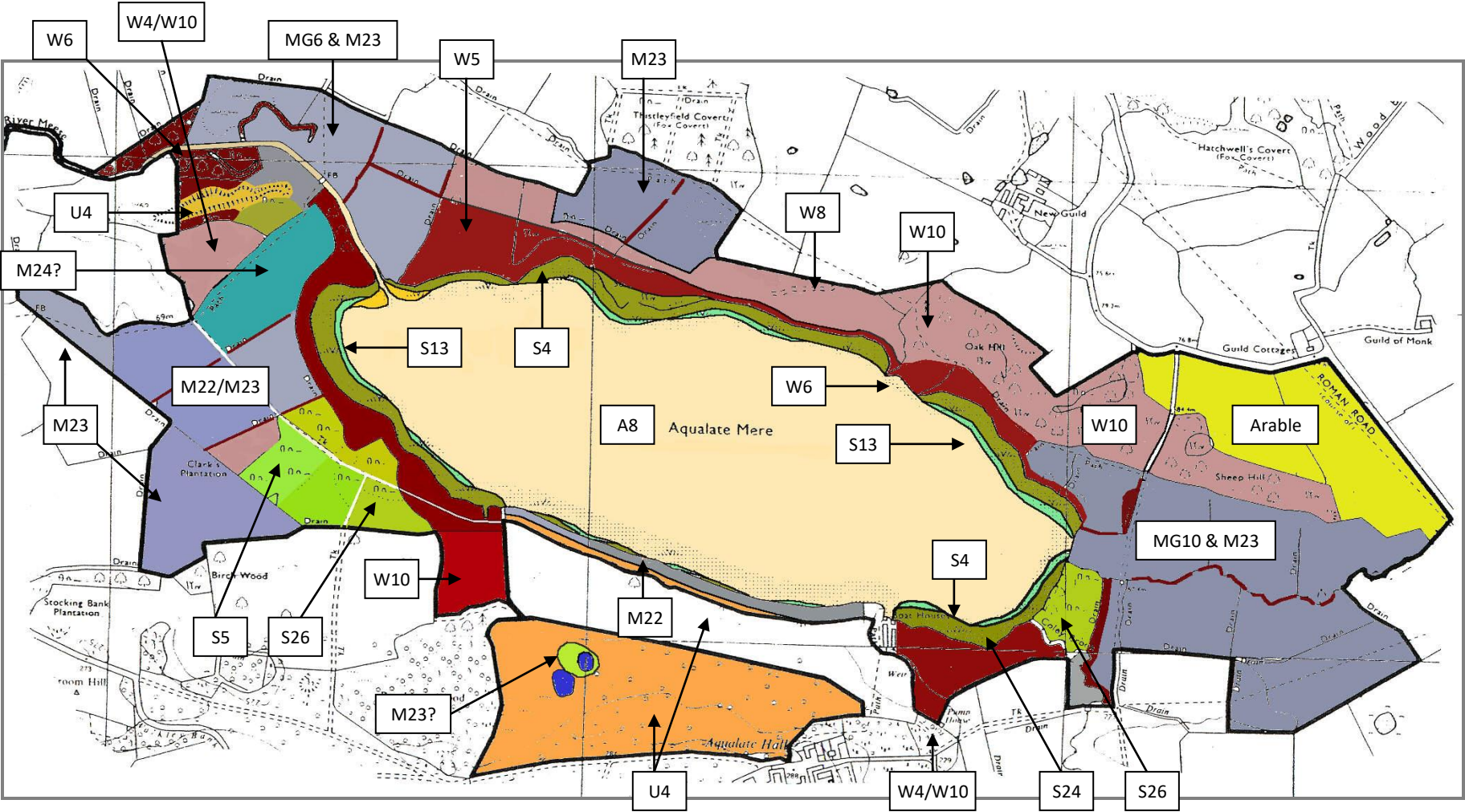
Where the fields have been completely fenced off and left unmanaged, large stands of reeds and other tall herbs have come to dominate, sometimes over areas of a hectare or so at a time. The vegetation in these areas includes S7 *Carex acutiformis* swamp, S5 *Glyceria maxima* swamp, T12 *Typha latifolia* swamp and S26 *Phragmites australis*-*Urtica dioica* fen, and there are often signs of succession to Alder woodland.

Around the edges of the site the fields are more intensively managed for agriculture, and MG6 *Lolium perenne*-*Cynosurus cristatus* grassland is not uncommon.

On the hills north of the mere there is both W8 *Fraxinus excelsior* woodland and W10 *Quercus robur* woodland. Where the land rises to the south of the mere the deer park has an acid grassland feel, possibly U4 *Festuca ovina*-*Agrostis capillaris*-*Galium saxatile* grassland. Something similar occurs on the ridge to the west.

The other area with characteristic vegetation is The Spectacles. This includes the best remaining stands of mire, which was evidently quite common at this site. Only one pool still has good vegetation; the other is closely grazed and muddy. Unfortunately, it seems that this is probably best described as M23 *Juncus effusus* rush-pasture again, although if this is correct it is an unusually species-rich and interesting variation.

Plan of the vegetation communities



Discussion and recommendations

Aqualate Mere is a eutrophic mere surrounded by hundreds of acres of drained peatland. It has an impoverished aquatic flora, the reason for which is not entirely evident. Unlike many lakes in the meres & mosses series it has never had any uncommon water plants (with the exception of *Potamogeton compressus*, which seems likely to have been an introduction). There are two possible explanations for its lack of a rich aquatic flora: either it is unsuitable in substrate or chemistry, or its quality deteriorated before any early botanical investigations took place.

Several possible reasons have been given for the continuing poor state of the aquatic flora. Eutrophication has been attributed on discharges from a nearby sewage treatment works. This can lead to algal blooms, which can block the light to submerged plants and effectively eradicate them from a site. Alternatively, excessive siltation could cause the substrate to become unsuitable, especially if compounded by populations of fish that disturb the sediment and/or eat the aquatic plants. The problem with these two theories is that Aqualate Mere is far from unique in these aspects of its ecology, and yet most of the other meres had an interesting aquatic flora in the past.

Perhaps the most obvious reason for the absence of aquatic macrophytes is predation by waterfowl. The lake is used by vast numbers of migratory birds, many of which are known to eat aquatic plants, including the roots and reproductive propagules of pondweeds (Preston 1995). In this regard Aqualate is very different to the other meres, because it is so shallow and so large.

There can be other reasons for the loss of an aquatic flora. One common factor is the stabilisation of water levels within a mere, which often leads to the loss of the draw-down zone on its margins. This in turn leads to shading of the shallow margins, either by woodland or by expanses of reedbed. Many aquatic plants thrive in these shallow margins and set seed on the bare mud of the drawdown zone. It seems likely that the Aqualate was drained many hundreds of years ago, and the outflow to the River Meese presumably stabilises the water level to a considerable degree.

As the use of this lake by migratory birds is one of the main reasons for it being a nature reserve, it is not realistic to propose that the birds should be controlled. However, the aquatic habitats could perhaps be enhanced by (1) maintaining the drains to contain more open water, and ensuring that they are not too shaded by trees and (2) allowing the water level in the mere to fluctuate rather more than it does at present, thereby creating a drawdown zone. It would be particularly beneficial if more of the margin were grazed by livestock.

The aquatic flora is only one of the features of interest at Aqualate. The site is perhaps best known for its *Cirsium dissectum* meadows, which may once have occupied many hectares around the mere. These would have been M24 *Molinia caerulea-Cirsium dissectum* meadows, although there are as yet no good vegetation samples recorded that prove its existence here. Some stands of pasture come close to this community, but they seem closer to M23 *Juncus effusus-Galium palustre* rush-pasture.

It would seem reasonable to consider M24 grassland to be one of the most desirable target communities at this site. This and M22 *Juncus subnodulosus* rush-pasture are sometimes considered to be poor quality agricultural grasslands, but in Staffordshire these wet meadow communities are types of vegetation that have almost completely gone, and they contain a suite of species that are now very rare in the county. They should be maintained by light grazing and periodic mowing (not every year). It is important not to allow trees to grow in the meadows, as this would make mowing impossible.

The reedbeds are another important feature of the site. These range from very species-poor swamps of *Typha angustifolia* and *Phragmites australis* around the mere, to species-rich fen that is probably S24 *Phragmites australis-Peucedanum palustre* fen, which is of very high conservation value. Swamps of intermediate richness include S26 *Phragmites-Urtica dioica* fen, *Glyceria maxima* swamp and various types of sedge swamp. These can occur at some distance from the mere on both the east and west sides, often extending for some distance beyond the NNR boundary.

The woodland around the site is of mixed quality. Around the north and west sides of the mere is some very good W5 *Alnus glutinosa* carr, which is always of conservation interest, but at Aqualate Mere seems to lack any of the rare species that are sometimes found in this type of vegetation. To the south-east there is W4 *Betula pubescens* woodland at Decoy Wood, but it has been invaded by *Rhododendron* and is rather too dry. It might well improve in quality if the water level were raised, and some of the

invasive alien species (which also include *Cornus sericea* and *Fallopia japonica*) might be controlled by this process. On the hills north of the mere there is W10 *Quercus robur* woodland, but most of this is replanted with exotic species such as *Castanea sativa* and it is managed as pheasant cover. With the exception of a few small areas at Round Hill and Anc's Hill, this woodland is not of high quality. The plantations west and south-west of the mere (Boathouse Wood and The Gorse, both W4) are similarly uninteresting, from a botanical point of view.

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